VOLUME 68 • JULY 1958 • NUMBER 1

A.M.A. ARCHIVES OF OTOLARYNGOLOGY

Laryngeal Vibrations: Measurements of the Glottic Wave
Rolf Timcke, Hans von Leden, and Paul Moore

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Recruitment A to Z
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Tumors of the Nose and Throat
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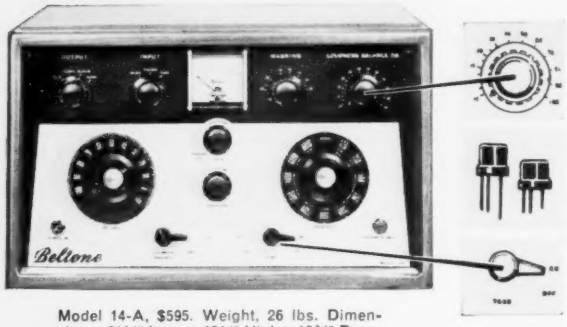

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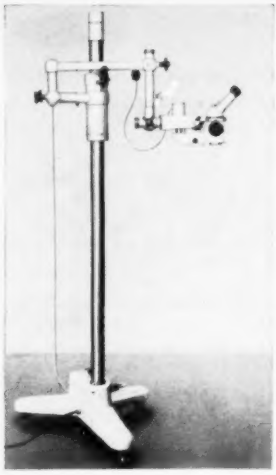

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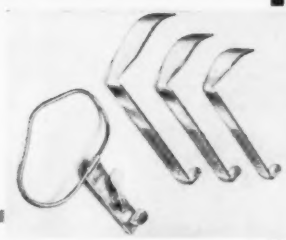

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Laryngeal Vibrations: Measurements of the Glottic Wave

Part I. The Normal Vibratory Cycle

ROLF TIMCKE, D.Sc.; HANS von LEDEN, M.D., and PAUL MOORE, Ph.D., Chicago

The student of laryngeal physiology encounters a wealth of diverse information on the subject of voice production: Different theories have been proclaimed and discussed heatedly by laryngeal scientists here and abroad, leaving the impression that many details are still nebulous and open to different interpretations.

It is true that numerous important observations have been recorded on the activities of the external and internal laryngeal muscles during phonation, on the behavior of the mucous membrane covering the vocal cords, on the acoustic characteristics of the voice, and even on the sensations experienced during voice production with different laryngeal adjustments or "registers." Yet detailed quantitative measurements of the fundamental entity of voice production, the vibratory function of the vocal cords in human subjects, have had to await the development of special instruments and their adaptation for these studies. Whereas earlier investigators depended entirely upon anatomical preparations from animals and cadavers for their experiments, or on estimates in the living subject, recent scientific advances now permit accurate measurements of the laryngeal wave in vivo by two different methods—ultra-high-speed photography, or electronic synchronstroboscopy.

Lacking adequate equipment, only a few investigators made any attempt to discover the secrets of the vibratory pattern. Thus Trendelenburg and Wullstein [15] (1935) confined their experiments to anatomical preparations procured from calves and from human cadavers. Employing the so-called "Schattenschriftmethode," they projected a light beam from the trachea through the glottis upon a photographic film mounted on a rotating drum above the larynx. The vocal cords were activated by a blast of air through the trachea, and the resulting vibratory motions were preserved as shadows on the moving film strip. The recorded impressions were almost rhomboid in shape, i. e., the lateral movement of the cords during the opening phase was linear until the maximal width had been reached, and the closure took place in the same linear proportion. No significant difference in the relative duration of the opening and closing phases was reported.

In a similar series of experiments Hartmann and Wullstein [4] (1938) attempted to measure the vibratory pattern with a photoelectric cell, which was activated by a light shining through the glottis from below. They also used specimens from calves and human cadavers, some of which were treated

Submitted for publication Jan. 31, 1958.

Dr. Timcke now residing in Hamburg, Germany.
From the Laryngeal Research Laboratory of The William and Harriet Gould Foundation and Northwestern University Medical School.

with special dyes to accentuate the absorption of light. In these experiments the vocal cords were approximated posteriorly by a suture placed around the vocal processes of the arytenoid cartilages, and air was forced through the adducted cords under pressure. The current generated by the photoelectric cell was then recorded as an expression of the glottic wave. The resulting waves resembled a series of positive sinusoidal waves, except that the opening phase of the vibratory wave was more gradual than the closing process. Higher frequencies were characterized by a relative shortening of the opening phase, but the closure remained of the same constant duration regardless of the change in pitch.

Husson and Tarneaud [5] (1932) were the first authors to describe details of vibratory motion in living human subjects. However, their observations were performed with an old-type stroboscope, based on a rotating disc. By virtue of its inherent limitations, this instrument permitted only approximations and estimates. On the basis of their observations, the authors published the following conclusions:

1. In the normal chest voice (or register) and at low pitch, the period of complete approximation in each cycle is longer than the open period during which the vocal cords abduct and adduct. Under the same conditions the opening phase (or period of vocal cord abduction) is shorter than the closing phase (or period of vocal cord adduction).

2. In the same type of open chest voice, but at higher pitch, the period of total approximation is relatively much longer than at a lower pitch level. The opening and closing phases are of equal duration.

3. In the so-called "covered" chest voice, often employed by singers before a change in register at about 330 cps, the period of total approximation is shorter than under the conditions outlined above. The opening phase is shorter than the closing phase.

4. In a falsetto voice, the period of total approximation is shorter than in all preceding examples. Opening and closing phases are again of equal duration.

Accurate measurements of vocal cord activity became possible in 1937, when the Bell Telephone Laboratories produced the first high-speed motion picture of the human larynx in action. This film portrayed several subjects as they produced isolated sounds ranging from 120 cps to 350 cps; it was subjected to a searching analysis by the Bell Telephone Laboratories,[1] and also by Farnsworth,[2] Fletcher,[3] and Pressman.[11] The following findings from the original article are pertinent to the present study:

1. "At a low pitch the folds may be tightly closed for nearly half of the cycle."

2. "At high intensity (and high pitches) a compressional wave may still be seen to traverse the width of the fold. The time which they remain tightly closed is smaller than at low pitch."

3. "The chief variation evident as intensity is changed, without changing the pitch, is that the cords close together very feebly, or, in fact, may not entirely close at very low intensities, while at high intensities they close firmly and may remain closed for an appreciable time."

4. "The widest opening during the cycle does not differ greatly with intensity change."

A comparison of these findings from the Bell publication with those of Husson and Tarneaud indicates that in regard to Item 2, or high pitch, the authors have come to the opposite conclusions.

Nothing at all is mentioned in the Bell publication concerning the relative speed of the vocal cords during their abduction and adduction. However, a recent study by Miller [7] of the Bell Telephone Laboratories, which is based on this film, reaffirms the established consensus that the opening phase of the glottic wave is shorter than the closing phase.

As indicated by Miller, this observation "is in contrast with the results from the method of using an inverse network to cancel out the effect of the impedance of the vocal tract. This technique, which, in effect, gives the volume velocity of the air through the glottal opening, shows that the closing phase is, in general, more abrupt. This abruptness is, of course, in terms of the volume velocity of the air." It is evident that Miller's observations contrast with those of Husson and Tarneaud on the relative speeds of abduction and adduction during voice production.

The perfection of the Electronic Synchronstroboscope provided a new instru-

ment for quantitative measurements of laryngeal vibrations. Coupling his Laryngo-Synchronstroboscope KS-3 (System Timcke) with an Oscilloscope, one of us (R. T.) [13] (1956) measured the relative durations of the open period (abduction and adduction) during each vibratory cycle, and the period of complete approximation. Expressing his results in terms of the *Open Quotient*,

$$\text{O. Q.} = \frac{\text{Fraction of Cycle During Which Glottis Is Open}}{\text{Duration of Entire Cycle}}$$

he reported this interesting observation:

> During normal voice production the O. Q. changed but little in relation to the frequency of vibration, with a tendency to increase slightly with a rise in pitch. For example, where the O. Q. in chest voice with weak intensity at a level of 120 cps amounted to 0.63, a change to 500 cps and head voice at continued weak intensity produced an increase of only a few decimal points to an O. Q. of 0.77.

These synchronstroboscopic measurements were continued by the same author (R. T.) [14] in the subsequent year, when he described the effect of a change in intensity on laryngeal vibrations at a constant pitch level. His published results prove that the O. Q. varies in inverse proportion to the change in intensity, i. e., that the O. Q. decreased with increasing intensity and increased with decreasing intensity. In one singer at 160 cps, for instance, the O. Q. at pianissimo was 0.70, and at forte 0.44.

These stroboscopic studies clearly indicate that a knowledge of both pitch and intensity is essential for a study of the *Open Quotient*. They further show that there is a close relationship between the O. Q. and the pitch, on one hand, and the absolute duration of the glottic air pulse *or* the absolute duration of the approximation, on the other; in either equation, two of the three factors must be known in order to calculate the third. These investigations thus confirm by detailed measurements the first three findings of the Bell publication as noted above.

With reference to the influence of "covering" on the voice, the synchronstroboscopic measurements revealed that there was little or no difference between the so-called "open" and the "covered" voice. In the former, for instance, the O. Q. was found to be 0.40, and in the latter 0.43, an insignificant variation within the tolerance of experimental error.

Plan of Investigation

After these preliminary observations on the *Open Quotient* in normal voice production, we resolved to explore the details of laryngeal vibrations during the opening and closing phases (vocal cord abduction and adduction) of the vibratory cycle, and to extend our investigations to the physiologic and pathologic variations from the normal pattern. We selected ultra-high-speed motion pictures for this purpose because this method offers the advantage of studying each vibratory cycle separately, frame by frame, without the possible distortion by superimposed images of successive cycles. At our disposal was the large collection of ultra-high-speed motion pictures of human vocal cords by two of us (P. M. and H. v. L.). Additional subjects were photographed for our specific objectives until approximately 15,000 ft. of film from numerous subjects, male and female, were available for this investigation. Our motion pictures were obtained with a Fastax Camera at speeds of 3000 to 5000 frames or pictures per second, and the voice of each subject was recorded to permit correlation of pitch and intensity. In addition, artificial larynges were constructed at our laboratory, and subjected to the same thorough investigation.

Technique of Investigation

For the frame by frame analysis of the pertinent film strips, a system of projection was devised whereby the vocal cords were magnified to approximately 15 times normal size. In order to relate the lateral excursion of the vocal cords to the total vibratory cycle, each picture was projected separately in sequence until the entire cycle had been measured. The center of the glottis was located by dividing the anteroposterior diameter in the midline. Unless some asymmetry was present, all measurements were taken through this plane, from the margin of one vocal cord to the

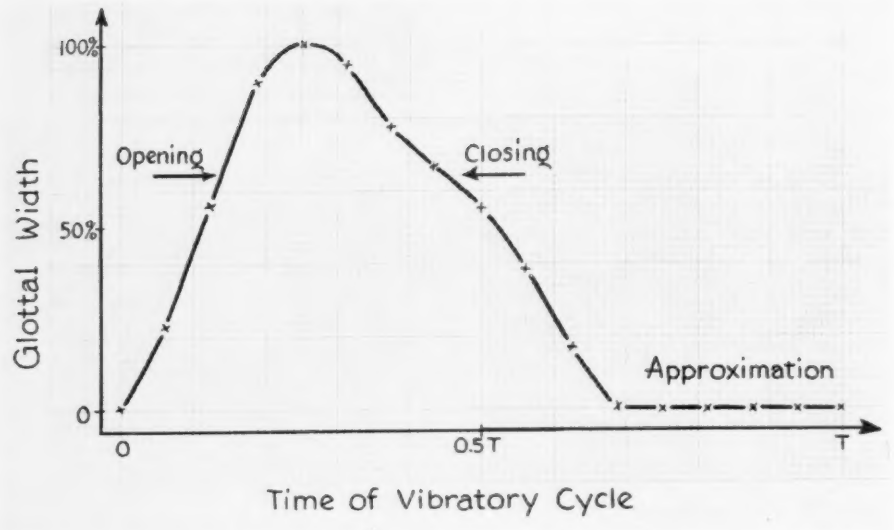


Fig. 1.—Graphic illustration of single vibratory cycle. The vertical axis or glottal width represents the lateral excursion of one vocal cord as percentage of maximal opening. The horizontal axis indicates the time (T) in fractions of one vibratory cycle. Measurements from successive frames are indicated by "X" marks within the curve. Rising section of the curve depicts the opening phase, the declining section the closing phase, and the horizontal section the period of approximation.

margin of the other cord, and the resulting figure was then divided by two.

To facilitate a comparison between the opening and closing phases under different conditions and in different subjects, the results were transcribed graphically in norm measures. On each graph (Fig. 1) the vertical axis represents one-half the glottal width, or the lateral excursion of *one* vocal cord as a percentage of the maximal opening, while the horizontal axis indicates the time in fractions of one complete vibratory cycle. The measurements from successive frames of the motion picture are indicated by the "X" marks within the curves. The term "lateral excursion" of the vocal cord refers to the distance from the midline of the glottis to that portion of the cord which in the two-dimensional photograph appears as the medial edge; in the beginning of the opening phase, this medial edge would be the upper lip of the vocal cord margin, and during the closing phase, the lower lip.

As a convenient yardstick indicating the difference in speed between the opening and closing phases, we selected the ratio between the opening phase and the closing phase; we termed this measure the *Speed Quotient*

$$S.\,Q. = \frac{\text{Time of Abduction or Lateral Excursion}}{\text{Time of Adduction or Medial Excursion}}$$

This term *Speed Quotient* is employed throughout our report in its abbreviated form S. Q. to designate the relationship between the opening and closing phases.

Findings

Part 1 of our report deals with the normal vibratory cycle during voice production, with special reference to the opening and closing phases of the glottic wave. Twenty-one representative graphs detail typical variations during changes in pitch and intensity, and the remaining two graphs present corresponding measurements on artificial models. The results of our studies are grouped in sections according to the type of phonation, in relation to pitch and intensity.

A. Chest Voice at Weak to Medium Intensity.—Figures 2 to 9 represent a selection of film strips from four different subjects, male and female, phonating in the chest register at low, medium, and high pitches, but always at weak to medium intensity. The analysis of these graphs leads to the following findings:

1. General Outline: Not one of the graphs presents the shape of a rhomboid or sinusoidal wave.

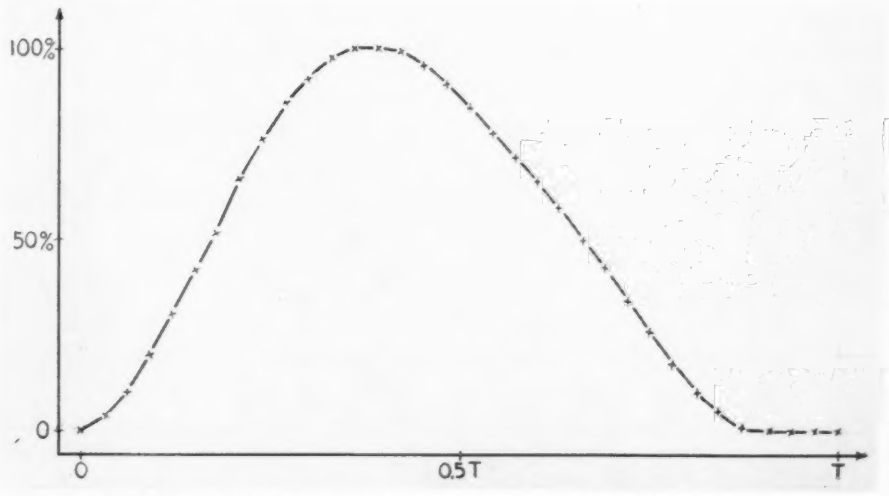
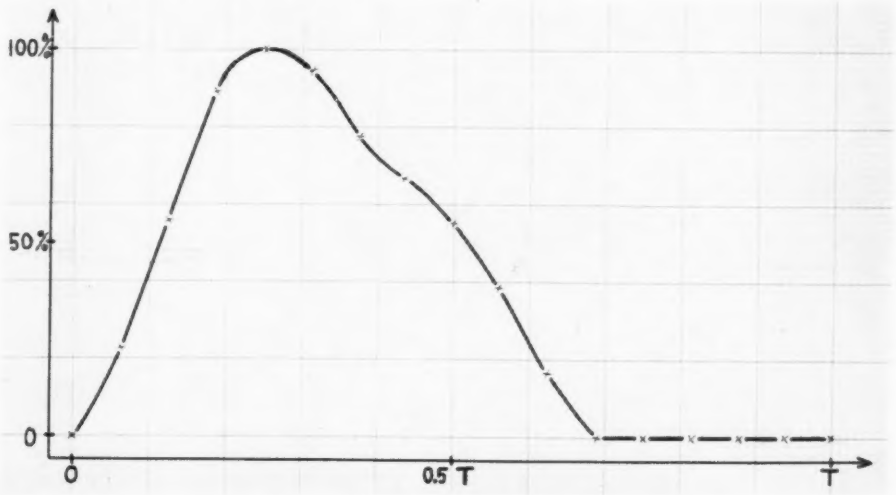


Fig. 2.—Subject "F." Phonation: constant. Register: chest. Pitch: low. Intensity: weak. O. Q.: 0.69. S. Q.: 0.57.

2. Speed Quotient: The most pronounced common characteristic of these eight graphs is the evidence that in each case the vocal cords open (or abduct) faster than they close (or adduct). In other words, they move laterally at a much higher rate of speed than their return to the medial position. Thus the S. Q. is always smaller than 1.0, here ranging from 0.50 to 0.78. (These findings would support the observations of Miller and others from the Bell film. Since photography of the phonating larynx is much easier at these intensities, it may be assumed that earlier high-speed motion pictures, such as the Bell film, were confined to such cases.)

3. Opening Phase: In most of these cases there is a gradual increase in speed

Fig. 3.—Subject "M." Phonation: constant. Register: chest. Pitch: low. Intensity: weak. O. Q.: 0.88. S. Q.: 0.74.



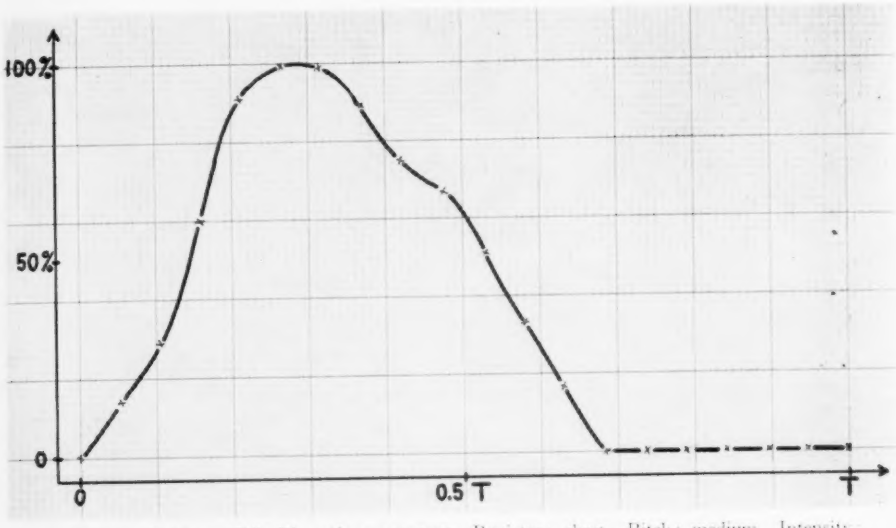
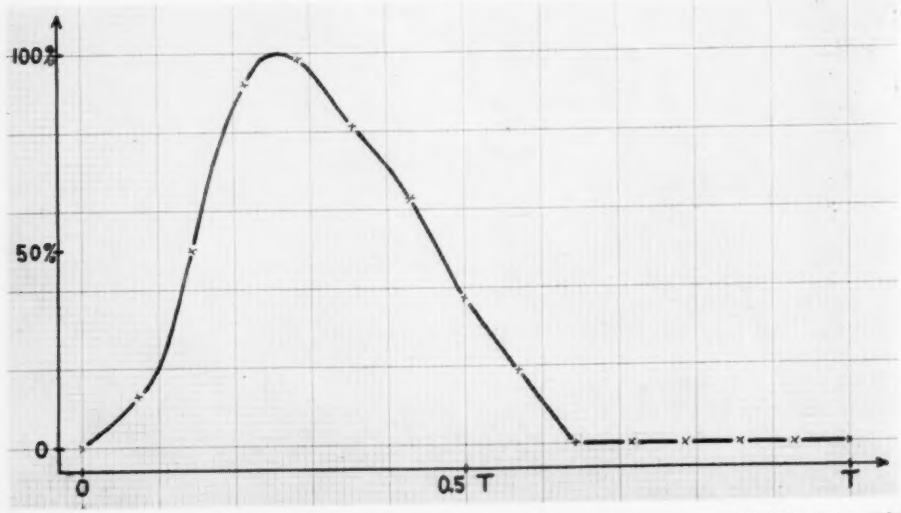


Fig. 4.—Subject "F." Phonation: constant. Register: chest. Pitch: medium. Intensity: weak to medium. O. Q.: 0.68. S. Q.: 0.66.

during the early part of the opening phase. Thereafter the speed remains almost constant until the cord has reached nearly its maximal lateral position.

4. Top of the Curves—Longitudinal Waves: The curves 2 to 6 and 9 show a soft, round top, whereas the curves 7 and 8 represent a flat plateau. This observation came as a surprise; yet repeated measurements of successive vibratory cycles ruled out any error. The fundamental difference in the vibratory pattern in these two cases became apparent when attention was diverted from the small central area of the cords (under consideration for measurements) to their entire length. In the two

Fig. 5.—Subject "T." Phonation: constant. Register: chest. Pitch: medium. Intensity: weak to medium. O. Q.: 0.64. S. Q.: 0.65.



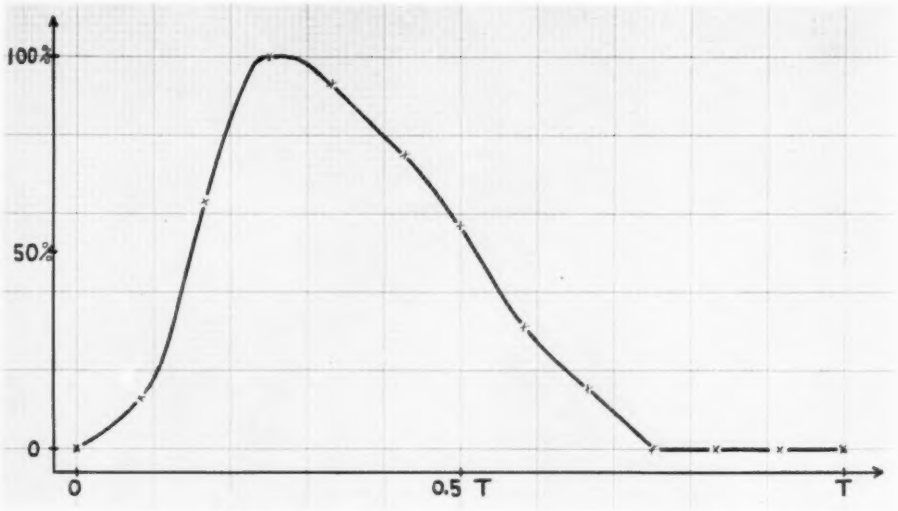
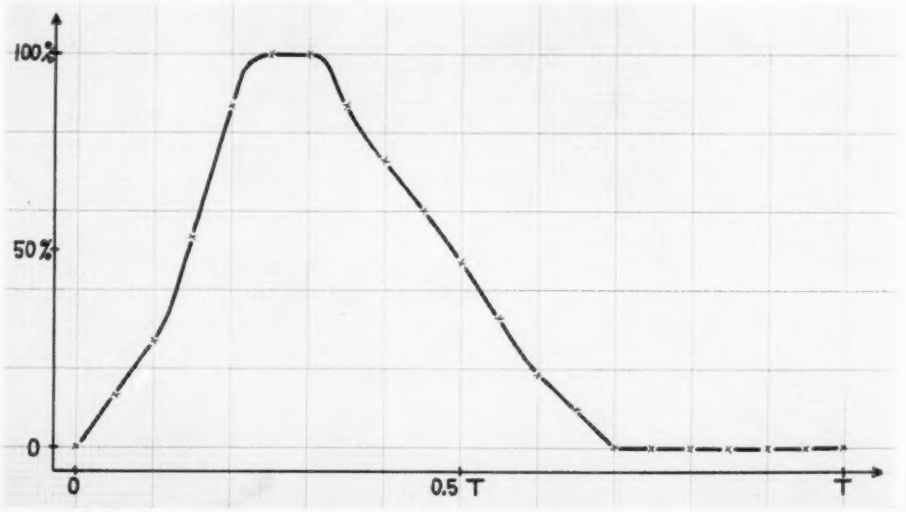


Fig. 6.—Subject "B." Phonation: constant. Register: chest. Pitch: medium. Intensity: weak. O. Q.: 0.75. S. Q.: 0.50.

cases under discussion the process of glottal opening did not originate in this central sector as usually observed, but at one of the commissures, thus traveling as a "longitudinal opening wave" along the length of the vocal cords. In Graph 7 this longitudinal wave originates in the anterior commissure and travels posteriorly, while Graph 8 presents the same phenomenon in the opposite direction. The resulting continuous phase shift along successive sections of the vocal cords produced this tendency to flatten the top of the curve. (Similar longitudinal waves have also been noted in the Bell publication,[1] by Smith [12] and by Van den Berg.[16])

Fig. 7.—Subject "B." Phonation: constant. Register: chest. Pitch: high. Intensity: weak to medium. O. Q.: 0.70. S. Q.: 0.63.



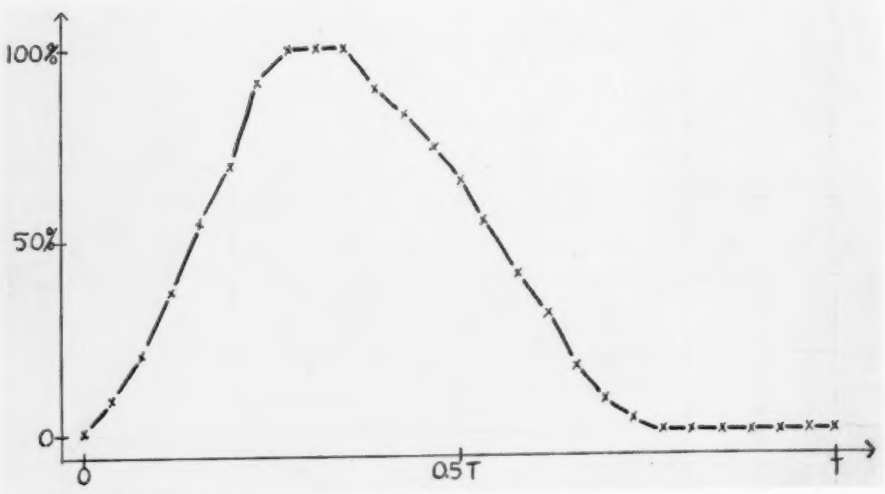
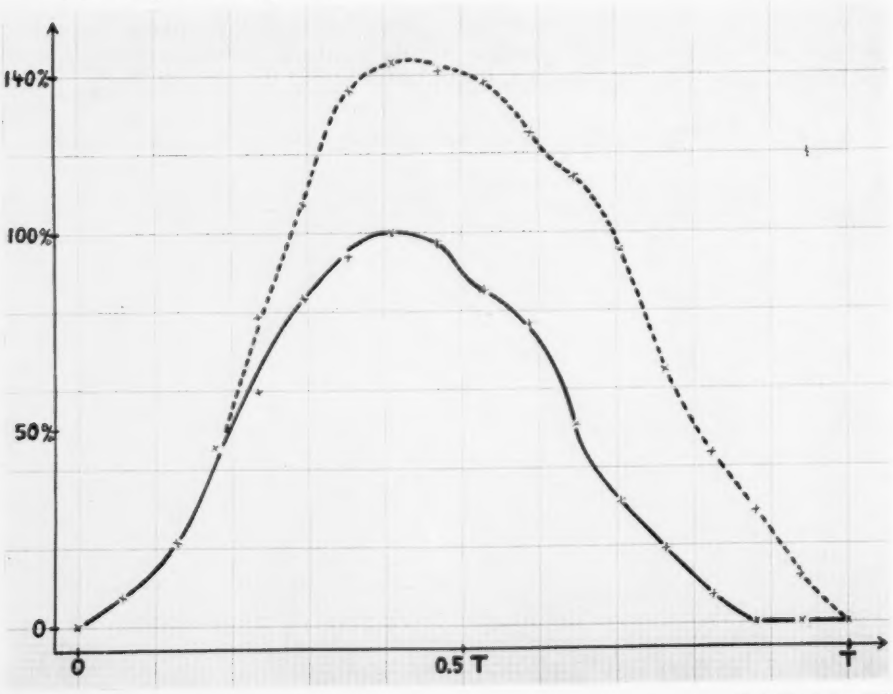


Fig. 8.—Subject "F." Phonation: constant. Register: chest. Pitch: medium. Intensity: medium. O. Q.: 0.75. S. Q.: 0.77.

Fig. 9.—Subject "B." Phonation: constant. Register: chest. Pitch: low. Intensity: medium. O. Q.: 0.88. S. Q.: 0.78.



5. Closing Phase: This portion of the glottic wave is also not a straight line, but shows in all of these cases a more or less developed convex hump.

6. Period of Approximation: At weak and medium intensities the period of approximation is relatively short, and the O. Q. is relatively long, here measuring from 0.64 to 0.88.

7. Vocal Coard Margin: As has been reported by two of us (P. M.[8-10,17] and H. v. L.[10,17]) as well as by Smith,[12] Farnsworth,[2] and Fletcher,[3] the free margin of the vocal cords should not be visualized as a thin ribbon, but rather as a thick fold, composed of upper and lower lips with different vibratory patterns. In order to obtain quantitative information on this observation, a film with extremely sharp focus was selected and the vibratory patterns of the upper and lower lips were recorded separately. The results are transcribed in Figure 9; the uninterrupted line represents the motion of the vocal cord as defined above, while the interruped line, together with the first section of the curve up to 0.18 T, represents the movement of the upper lip alone.

Apparently the amplitude of the upper lip is considerably greater than that of the lower lip—40%. While the shape of both curves is similar, there is a definite phase shift between the two movements, with the upper lip lagging behind the lower lip. Thus, the lower lip reaches the midline 0.12 T earlier than the upper—a phase shift of 43 degrees. The phase shift at the point of maximal opening, however, is smaller—about 11 degrees. (One full cycle equals 360 degrees.) It is also of interest to note that the O. Q. of the upper lip movement is 1.0, i. e., the two edges approximate but momentarily, whereas the lower lip has an O. Q. of 0.88. A study of the subsequent graphs indicates many similarities with the characteristics discussed in detail under Group A. In the following groups, therefore, only dissimilar points will be stressed.

B. Chest Voice at Extremely Weak Intensity.—Figure 10 presents a chest voice at low pitch and very weak intensity.

Speed Quotient: At this very weak intensity the S. Q. has decreased markedly to 0.28.

Top of Curve: Again, as in Graphs 7 and 8, the rounded top of the curve has been replaced by a flat plateau, but in this case the reason for this departure is even more complicated. Here the longitudinal wave starts at the anterior commissure and travels to the vocal process, whence it is "reflected" back towards the point of origin. Such a phenomenon might be termed a "reflected longitudinal opening wave"; to our knowledge it has not been reported previously. In this connection it is of interest to note that Graphs 7, 8, and 10 represent three normal subjects at pitch levels ranging from high to low. Our studies reveal no relation between this longitudinal opening wave and pitch, or subject, since other motion pictures of the same subjects show the characteristic rounded top.

Period of Approximation: At extremely weak intensities, as on this Graph 10, the vocal cords do not approximate completely, thus producing an O. Q. of 1.0.

C. Intensity Changes in Chest Voice.—In order to study the effect of a change in the intensity of the voice on the vibratory pattern of the vocal cords, four different photographic subjects were used. Each subject was asked to sound the same tone at weak and strong intensities, or to increase (or decrease) the intensity of the sound in a continuous crescendo (or decrescendo). To permit a factual comparison, pitch and timbre of the voice were maintained at the original level. Figures 11 to 18 show the glottic wave in these cases; they reveal an extremely important yet hitherto undiscovered fact:

Speed Quotient: While at weak intensities the opening phase is always shorter than the subsequent closing phase, the opposite holds true when the voice increases

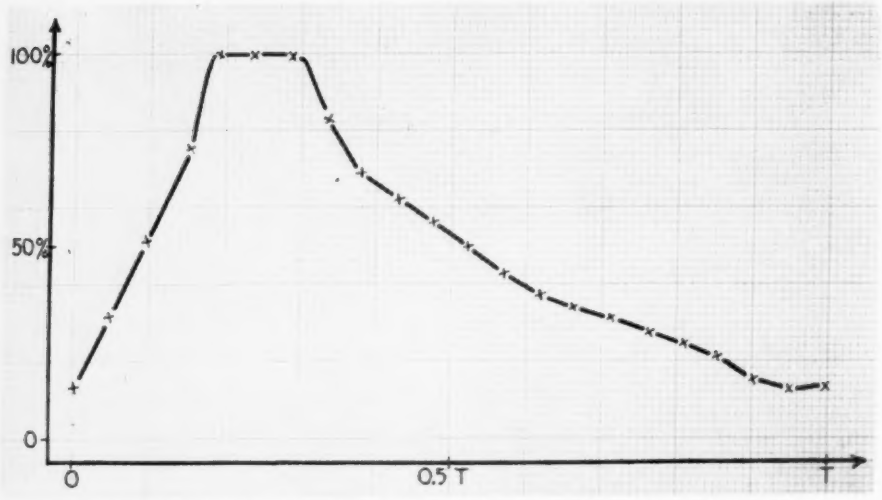
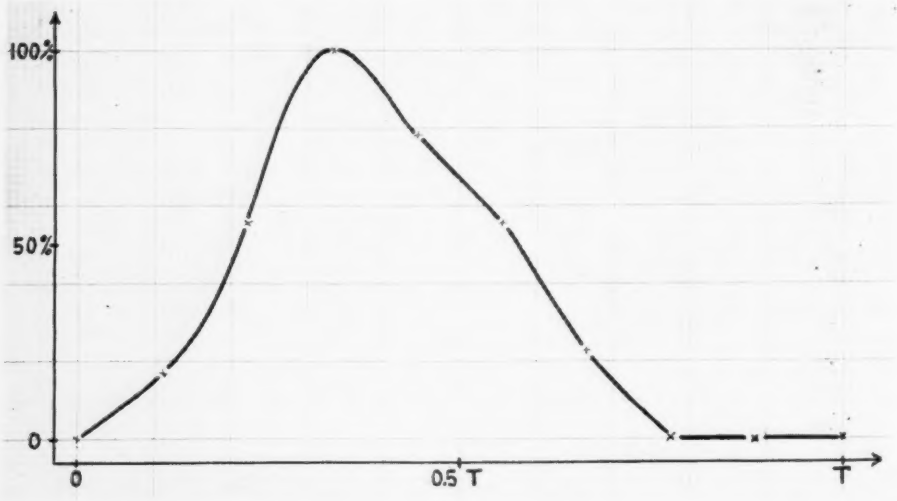


Fig. 10.—Subject "V." Phonation: constant. Register: chest. Pitch: low. Intensity: very weak. O. Q.: 1.0. S. Q.: 0.29.

in volume. At loud voice the lateral motion of the cords (or abduction) consumes more time than the return to the midline (or adduction). Whereas at weaker intensities the S. Q. remains always below 1.0 (as demonstrated in Group A), an increase of intensity to a loud level raises the S. Q. above 1.0. Thus, in the four cases under discussion, the S. Q. varies from 0.76 to 0.89 at weak or medium intensities, but increases to approximately twice that amount at loud volume—1.3 to 2.0.

Opening Phase and Closing Phase: The opening and closing phases of Graphs 11, 13, 15, and 17, at weaker intensities, resemble those of Group A. After the initial incline, the opening phase is relatively straight, with a convex hump in the slower

Fig. 11.—Subject "S." Phonation: crescendo. Register: chest. Pitch: medium. Intensity: weaker. O. Q.: 0.78. S. Q.: 0.76.



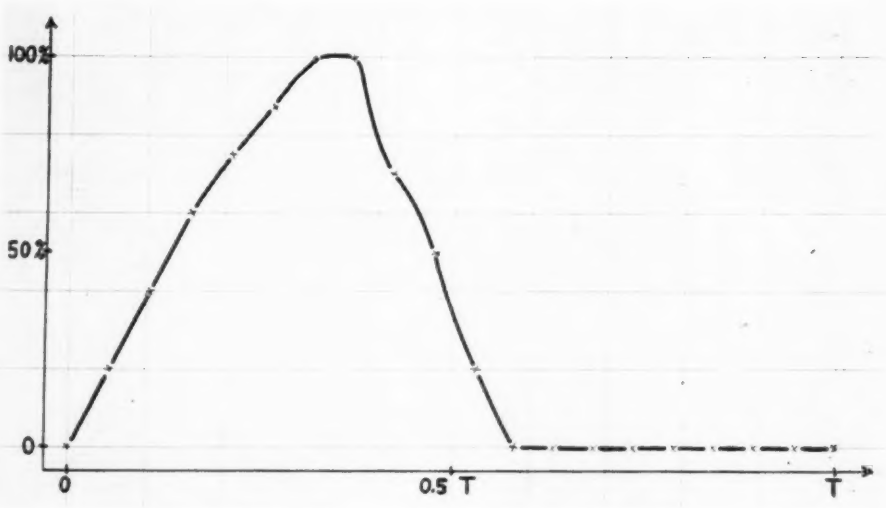


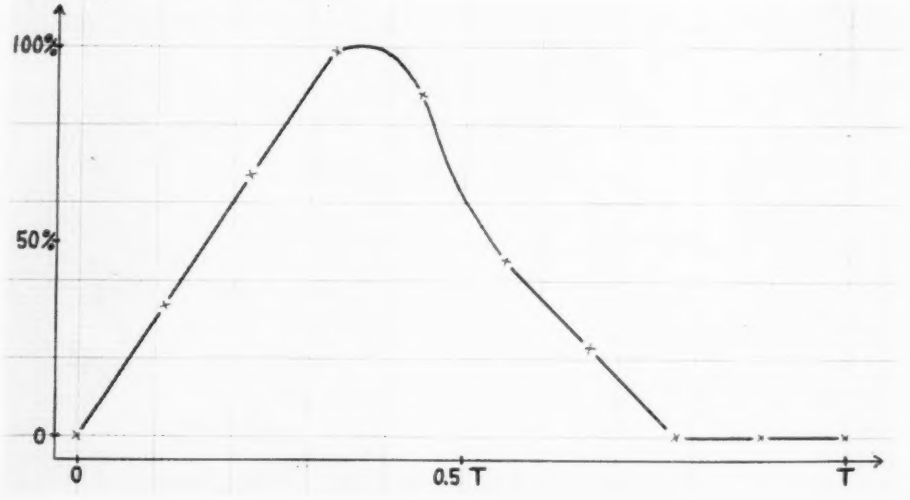
Fig. 12.—Subject "S." Phonation: crescendo. Register: chest. Pitch: medium. Intensity: louder. O. Q.: 0.58. S. Q.: 1.3.

closing phase. In the remaining graphs, at stronger intensities, the configuration differs, with a tendency to form a hump during the opening phase of the glottic wave.

Period of Approximation: In each case the O. Q. of the glottic wave decreases with increasing intensity. (This observation confirms the synchronstroboscopic measurements described above.)

Maximal Amplitude: The maximal amplitude or widest opening of the glottis during each cycle increases considerably with increasing intensity. In Graphs 13 and 14, for instance, the ratio is 1.0 to 2.2.

Fig. 13.—Subject "V." Phonation: crescendo. Register: chest. Pitch: medium. Intensity: weaker. O. Q.: 0.78. S. Q.: 0.86.



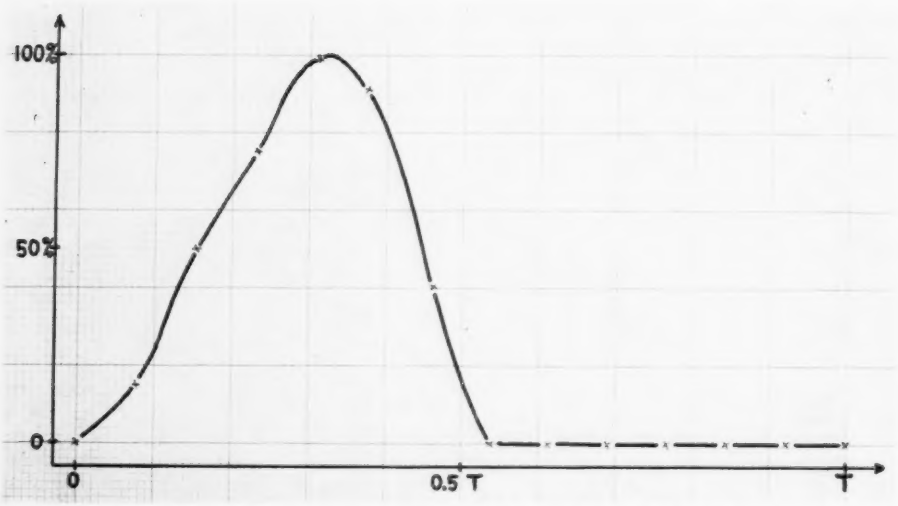
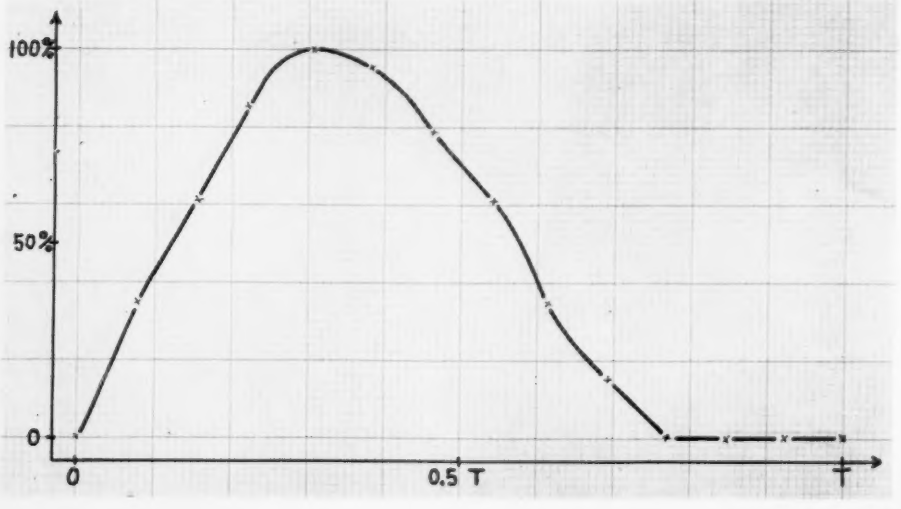


Fig. 14.—Subject "V." Phonation: crescendo. Register: chest. Pitch: medium. Intensity: louder. O. Q.: 0.54. S. Q.: 1.5.

which indicates that at loud voice (Graph 14) the widest opening of the glottis is 2.2 times at great as at soft voice (Graph 13). Similarly, at the louder intensity of Graph 18, the maximal amplitude is 1.8 times as great as that of Graph 17 at weaker intensity. (These findings of variations in amplitude with intensity changes are at variance with the observations of the Bell publication[1] on this subject. However, they fully support Luchsinger's[6] measurements and conclusions.)

D. Pressure Changes in Chest Voice.—The effect of a change in air pressure on the vibratory pattern of the vocal cords was ascertained by a simple maneuver: A subject phonating at very weak intensity

Fig. 15.—Subject "T." Phonation: constant. Register: chest. Pitch: low. Intensity: weak. O. Q.: 0.77. S. Q.: 0.67.



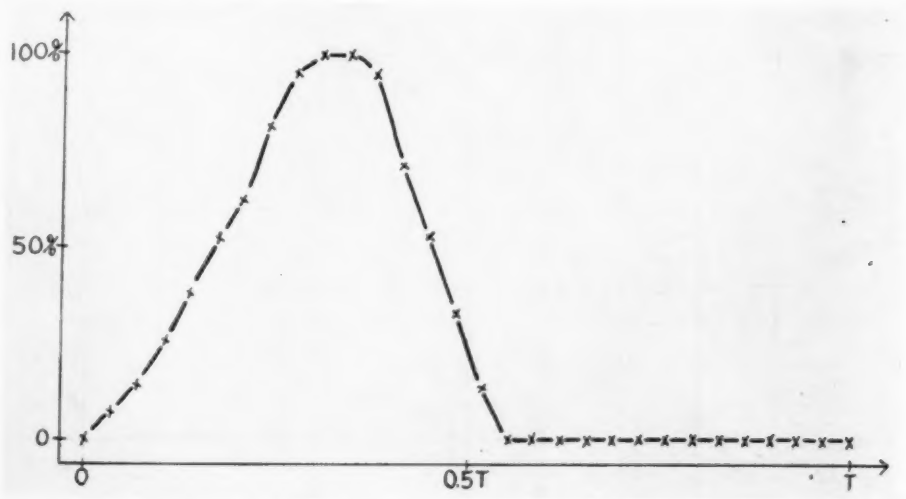
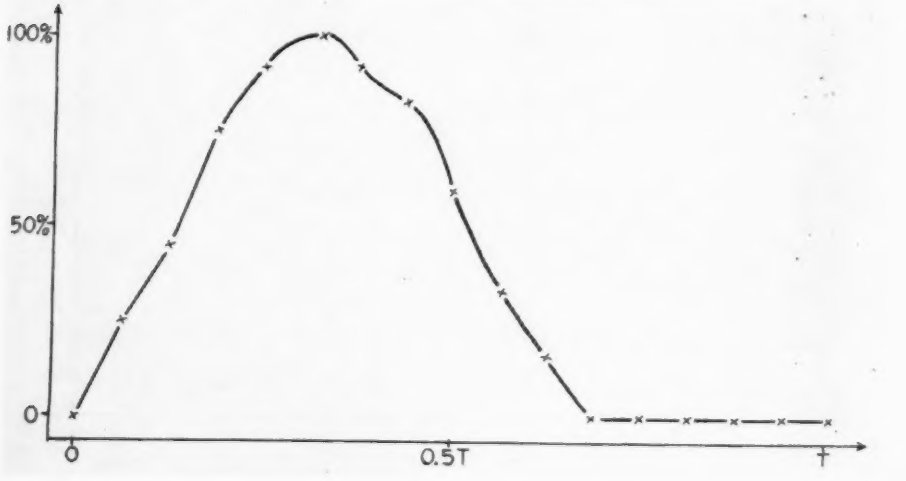


Fig. 16.—Subject "T." Phonation: constant. Register: chest. Pitch: low. Intensity: loud. O. Q.: 0.55. S. Q.: 1.6.

received a sudden and firm push on the abdomen, resulting in a momentary increase of pressure in the tracheal air column. The resulting changes are shown on Figure 19, representing one typical vibration before the push, and Figure 20, approximately $^1/_{10}$ of a second or 27 vibrations later, at the height of the "push." A study of the two graphs confirms that the pitch was maintained at about the same level throughout this procedure. Measurement of the sound intensity with a vacuum-tube voltmeter from the magnetic tape recording revealed an average increase of only 6 db. at the height of the abdominal "push."

Speed Quotient: With the rise in air pressure, the S. Q. rapidly increased from

Fig. 17.—Subject "B." Phonation: decrescendo. Register: chest. Pitch: low. Intensity: weaker. O. Q.: 0.69. S. Q.: 0.89.



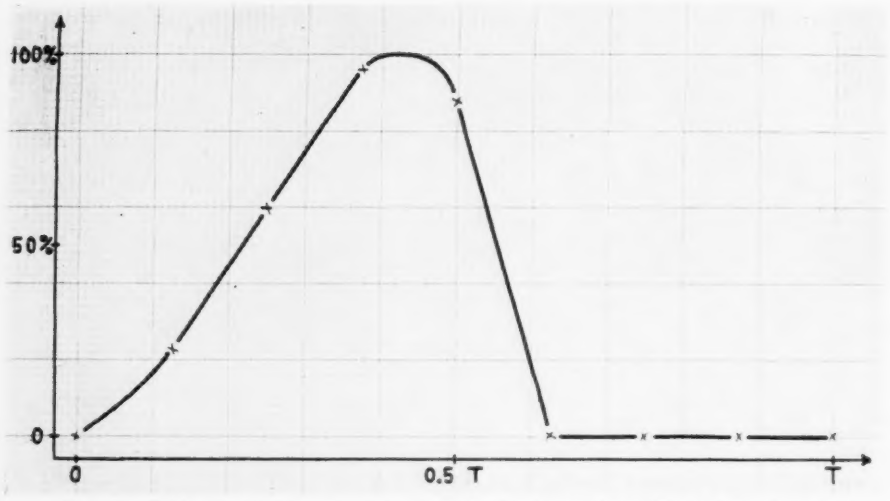


Fig. 18.—Subject "B." Phonation: decrescendo. Register: chest. Pitch: low. Intensity: louder. O. Q.: 0.63. S. Q.: 2.0.

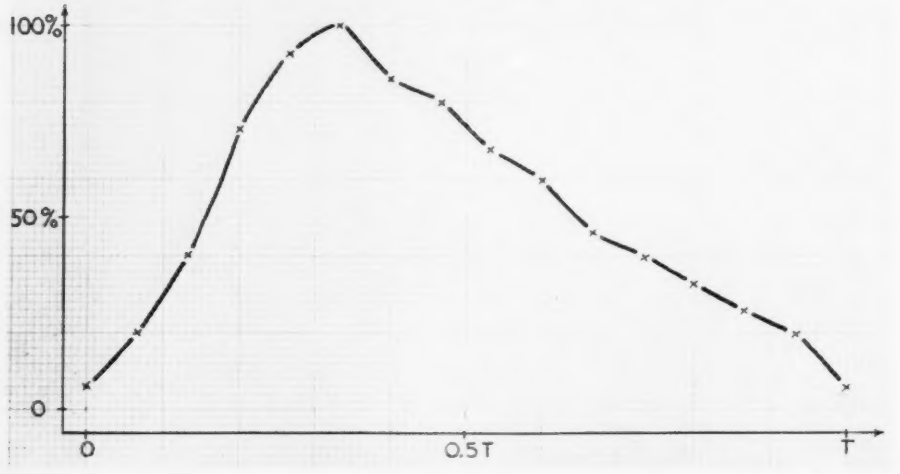
0.5 to 1.0 and remained at this level until the pressure subsided.

Period of Approximation: Concurrently the O. Q. decreased from 1.0 at very weak intensity to 0.85 at the height of the pressure.

Maximal Amplitude: Accurate measurements indicate that the maximal width of the glottis during individual vibrations increased 29% with the rise in pressure.

A comparison of these findings with those of the previous group reveals that the effect of increasing air pressure upon the vibratory pattern of the vocal cords resembles the changes noted with a voluntary increase in intensity. (Perhaps these observations explain the hitherto baffling results of Miller's experiments, in which he measured the volume velocity of air passing through the larynx during phona-

Fig. 19.—Subject "V." Phonation: push. Register: chest. Pitch: low. Intensity: very weak. O. Q.: 1.0. S. Q.: 0.5.



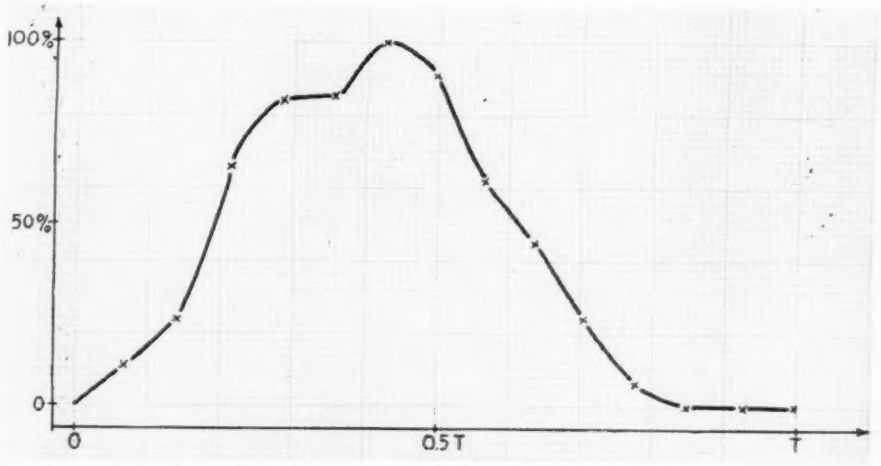


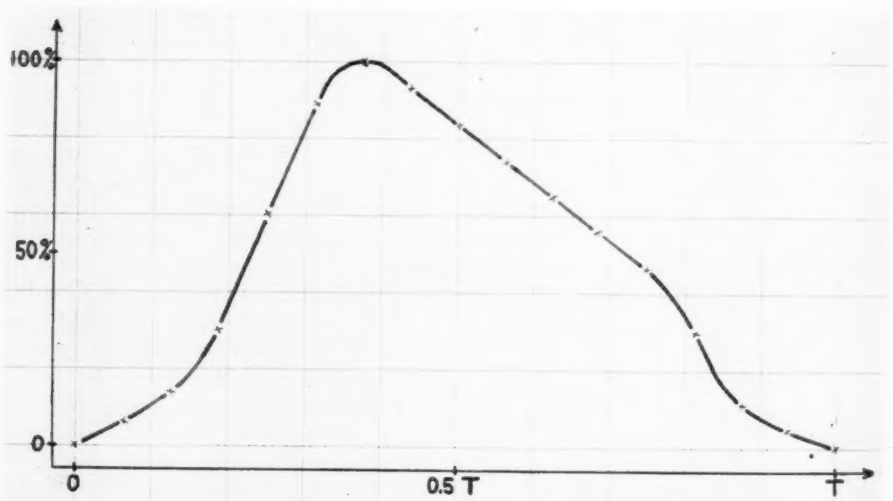
Fig. 20.—Subject "V." Phonation: push. Register: chest. Pitch: low. Intensity: weak. O. Q.: 0.85. S. Q.: 1.0.

tion. It seems logical to assume that these experiments required strong air pressure in the production of voice.)

E. Head Voice.—Singers employ different laryngeal adjustments to produce different tones. The preceding Graphs 2 to 20 dealt with voice production in the commonly used "chest register." Figures 21 and 22 portray the so-called "head register." Figure 21 pictures the vibratory pattern of a head voice phonating at very weak intensity and medium pitch. Figure 22 represents typical vocal cord vibrations of a head voice at fairly loud intensity and high pitch.

Speed Quotient: Analogous to the above-mentioned findings in the chest register, Graph 21 at weak intensity shows a low S. Q. of 0.61, whereas Graph 22 at louder intensity demonstrates an S. Q. of 1.4.

Fig. 21.—Subject "T." Phonation: constant. Register: head. Pitch: medium. Intensity: weak. O. Q.: 1.0. S. Q.: 0.61.



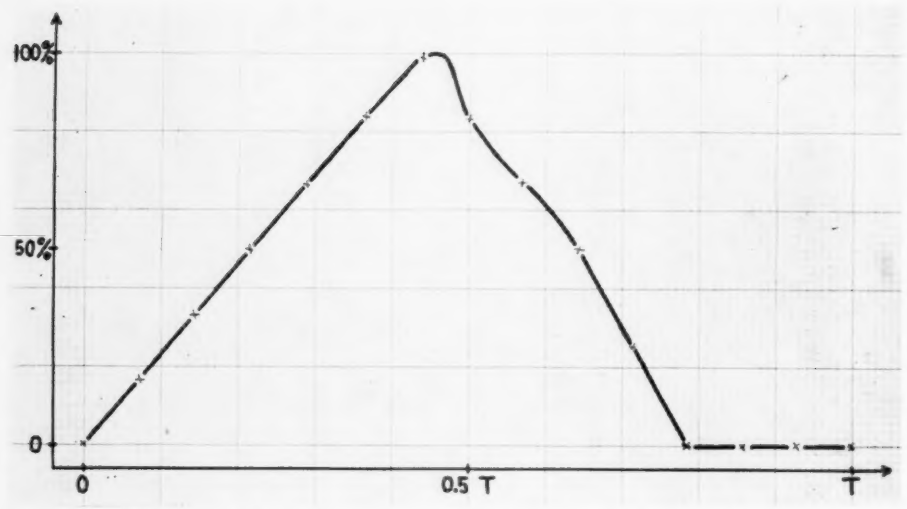


Fig. 22.—Subject "S." Phonation: constant. Register: head. Pitch: high. Intensity: loud. O. Q.: 0.78. S. Q.: 1.4.

Period of Approximation: As in the chest register, the relaxed vocal cords on Graph 21 show an O. Q. of 1.0 at weak intensity. But the increase in volume on Graph 22 corresponds to the lower O. Q. of 0.78.

These findings clearly indicate that fundamentally there is no basic difference between these changes in the vibratory patterns of head and chest registers. The weaker the intensity and the more relaxed the cords, the greater the O. Q. and the smaller the S. Q., and vice versa. In view of the different laryngeal adjustments in the two registers, the actual values of the O. Q. and of the S. Q. differ, of course. Graphs 5 (chest voice) and 21 (head voice), for example, were produced by the same subject phonating at approximately the same pitch (250 cps) and about the same weak intensity. Yet in one instance the O. Q. is 0.64 and in the other 1.0—the result of greater relaxation in the head register at this pitch level.

F. Artificial Models.—In view of the difficulties experienced in studying the mechanism of voice production in vivo, repeated attempts have been made to construct artificial models and to compare their behavior with that of human vocal cords in action. For the purposes of this investigation two such models or "pipes" were constructed, activated by blowing, and photographed in the same manner as the human vocal cords.

1. The first "pipe" was built of a vertical very thin-walled rubber tube (representing the trachea), and two horizontal strips of foam rubber (representing the vocal cords). It was patterned after a model presented by Svend Smith of Copenhagen, Denmark, at the Ninth Meeting of the German Society for Speech and Voice Therapy in May, 1956. The frequency of this "pipe" was 176 cps. Since there was almost no phase shift between the upper and lower edges of the vibrating "cord margin," it would simulate the head register. Measurements transcribed from motion pictures of this "pipe" are represented by Figure 23. It is evident that this rubber model shows a vibratory pattern which is, in fact, similar to that of human vocal cords, with an O. Q. of 0.76 and an S. Q. of 1.1.

2. The second "pipe" was constructed by Smith himself for the International Voice Conference at Chicago in May, 1957. This model consists of a somewhat thicker

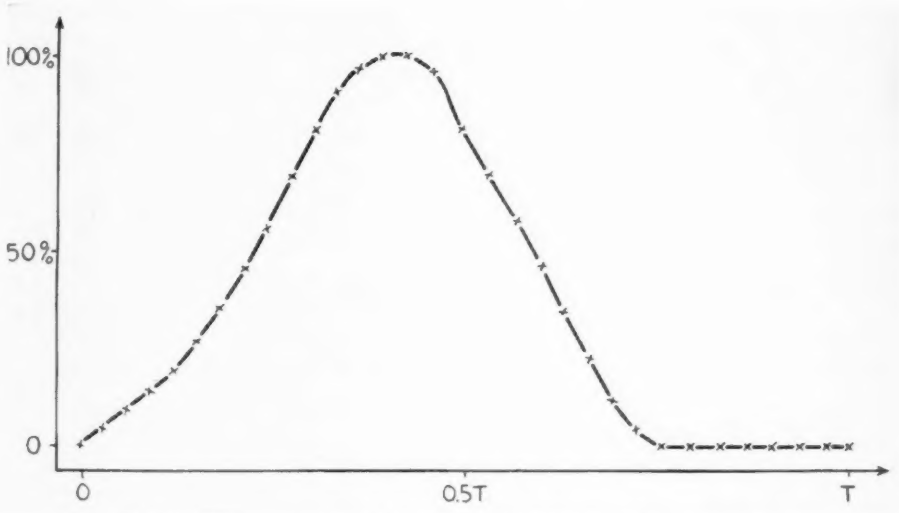


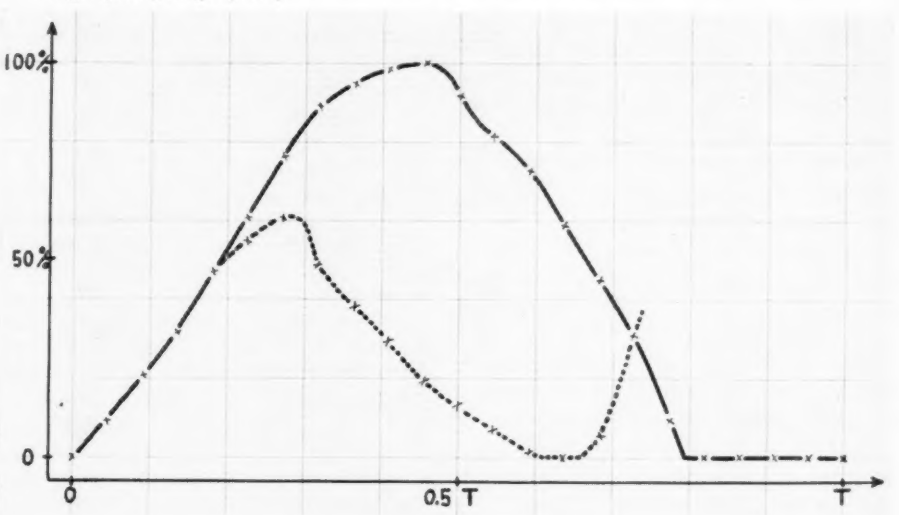
Fig. 23.—Pipe 1. Phonation: model. Register: head. Pitch: medium. Intensity: medium. O. Q.: 0.76. S. Q.: 1.1.

vertical rubber tube which is reinforced at its distal end by two horizontal rubber strips of the same material; the latter were employed to tense or relax the cords with the production of different pitch levels.

Figure 24 indicates the resulting measurements: the uninterrupted curve represents the upper edge of the "cord margin," which is also the end of the rubber tube. The interrupted curve and the first section of the common curve up to 0.18 T represent the amplitude of the "cords" as defined initially.

It is apparent from this graphic analysis that the shape of the curves during the first

Fig. 24.—Pipe 2. Phonation: model. Register: chest. Pitch: medium. Intensity: medium. O. Q.: [0.64.] S. Q.: [0.77.]



⅔ of the vibratory cycle is similar to that of human vocal cords. Towards the end of the cycle, however, from about 0.6 T on, the upper edge is still in the process of closing, while the lower edge is already beginning to open. This great phase shift between upper and lower edges is due to the construction of this particular "pipe" in which the thickness of the "vocal cord" is of approximately the same dimensions as the length of the "cord"—quite different from the human larynx.

Conclusions

1. *Shape of the Glottic Wave.*—The vibratory pattern of human vocal cords does not resemble a rhomboid or a sinusoidal wave. The process of abduction (or opening phase) differs from that of adduction (or closing phase).

2. *Descriptive Terms of Measurement.* Convenient measures for the basic description of the components of a vibratory cycle are the *Speed Quotient* and the *Open Quotient.*

3. *Speed Quotient.*—The S. Q. varies directly with the intensity of the sound produced; it is not influenced by sex or changes in pitch and/or register. Variations in the S. Q. are evidently caused by the degree of tension in the vocal cords and by the force of the air pressure.

4. *Open Quotient.*—The O. Q. is inversely proportional to the intensity of the sound produced; it varies but slightly with changes in pitch.

5. *Glottal Width.*—The amplitude of the laryngeal vibrations increases markedly with greater intensity.

6. *Longitudinal Opening Waves.*—"Longitudinal opening waves" originating from the anterior or posterior commissures occur under certain conditions. "Reflected longitudinal opening waves" also exist. All longitudinal waves observed had a tendency to flatten the top of the vibratory curve; that is, the sector of vocal cord under measurement tends to remain at its maximum opening for a longer period of time.

7. *Head Register.*—The effect of variations in pitch and intensity on the O. Q. and on the S. Q. in the head register is similar to that of the chest register.

8. *Artificial Models.*—Artificial models or "pipes" are of limited value in the study of laryngeal vibrations.

Summary

Previous observations regarding longitudinal opening waves and the relative durations of glottic air pulse and closure (Open Quotient) were confirmed.

Controversial issues regarding the amplitude and the shape of the normal glottic wave were resolved.

New observations are presented concerning the opening and the closing phases of vocal cord vibrations, concerning the influence of changing intensity and air pressure on the glottic wave, and concerning the phenomenon of reflected longitudinal opening waves. A thorough search of the literature reveals no reports of similar observations.

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The Influence of Some Expectorants on the Rate of Ciliary Beat in the Trachea of Living Rats

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In an earlier paper [1] I reported the effect of some nose-drop solutions on the ciliary activity in the upper respiratory tract. The clinical significance of decelerated ciliary beating was also discussed. Attention was drawn to the risk of respiratory-tract infection when mucus flow is retarded or arrested. The effect of the solutions on ciliary activity is not the only important factor, however. Their bactericidal properties must also be taken into account.

Similar studies have now been performed with agents which, because of their expectorant effects, are traditionally included in many cough syrups. Ammonium chloride, potassium iodide, sodium citrate, and ipecac fluidextract and senega fluidextract were used in these tests. In recent years agents which more markedly reduce surface tension have also been included in cough mixtures. The study was therefore extended to comprise sodium lauryl sulfate, polyoxyethylene sorbitan monolaurate (Tween 20) and polysorbate 80 (polyoxyethylene sorbitan monooleate, Tween 80). All the substances were tested in concentrations corresponding to those generally employed in cough mixtures.

The solutions were administered orally and not, as in the nose-drop tests, by local application. Oral administration was accomplished via a tube to the stomach. The method of determining the ciliary activity was as described by Dalhamn.[2]

Rats were the experimental animals. The rate of ciliary beat was first recorded. The test solution (0.5 cc.) was then run into the gastric tube. As soon as possible (about 3 minutes as a rule) afterward, a second record of ciliary activity was made. Fifteen minutes after administration of the test solution the rate of ciliary beat was recorded for the third time. Each agent was tested on six rats.

The Table shows that, of the expectorants, sodium citrate (1%) and potassium iodide (1%) brought about a statistically significant increase in the rate of ciliary beat. The respective frequencies of 1429 and 1246 beats per minute rose after 3 minutes to 1557 and 1352 and after 15 minutes to 1675 and 1418 beats per minute. Of the other tested agents, sodium lauryl sulfate (0.02%) and polyoxyethylene sorbitan monolaurate (0.3%) and polysorbate 80 (0.3%) all seemed to have a statistically verifiable action on ciliary beating. Thus the respective initial values of 1483, 1341, and 1454 beats per minute became 1734, 1470, and 1603 after 3 minutes and 1705, 1563, and 1695 after 15 minutes.

It was considered noteworthy that all the solutions which influenced ciliary activity did so immediately (c. 3 minutes after administration); in no case was this action delayed until the 15-minute test. The mode of reaction—or rather absence of reaction—to the other agents (ammonium chloride and extracts of ipecac and senega) was essentially uniform: neither immediately nor 15 minutes after administration was any statistically significant effect on ciliary activity discernible.

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From the Department of Occupational Health, The National Institute of Public Health, Stockholm; Head: Prof. A. Ahlmark.

Effect of Various Expectorants on Ciliary Activity

Substance Administered	Ciliary Activity (Beats per Minute)				Ciliary Activity (Beats per Minute)		
	Initial Rate	Rate Immediately After Medication	Difference from Initial Rate	*P* Value	15 Min. After Medication	Difference from Initial Rate	*P* Value
Ammonium chloride 1%	1475	1574	99	$P>0.2$	1474	−1	$P>0.2$
Potassium iodide 1%	1246	1352	106	$0.05>P>0.01$ (x xx)	1418	172	$0.01>P>0.001$ (xx xxx)
Sodium lauryl sulfate 0.02%	1483	1734	251	$P>0.001$ (xxx)	1705	222	$P>0.001$ (xxx)
Fluid extr. ipecac 0.2%	1379	1425	46	$P>0.2$	1427	48	$P>0.2$
Fluid extr. senega 0.6%	1447	1454	7	$P>0.2$	1444	−3	$P<0.2$
Tribasic sodium citrate 1%	1429	1557	128	$P<0.001$ (xxx)	1675	246	$P>0.001$ (xxx)
Tween 20 * 0.3%	1341	1470	129	$0.01>P>0.001$ (x xxx)	1563	222	$0.03>P>0.01$ (x xx)
Tween 80 † 0.3%	1454	1603	149	$0.01>P>0.001$ (xx xxx)	1695	241	$0.05>P>0.01$ (x xx)

*Polyoxyethylene sorbitan monolaurate.
† Polyoxyethylene sorbitan mono-oleate.

Comment

The results of this study may be viewed from at least two aspects. The general, and probably most important, is as follows. The method has previously been employed for determining the rate of ciliary beat after single and repeated exposure to respiratory irritant gases (SO_2, $HCHO$, and H_3N) and after local application of nose-drop solutions. It would now seem clear that the method is also suitable for studying the response of ciliary activity to various orally administered pharmaceutical agents. The latter possibility may be of value in many circumstances, for instance, for study of the functional reaction as regards the rate of ciliary beat in allergic manifestations such as rhinitis.

The more specific interest of the results is, of course, the influence on ciliary activity of the tested agents, particularly the expectorants.

The widely used expectorants, ammonium chloride and fluidextracts of ipecac and senega had no influence on ciliary beating, while potassium iodide, sodium lauryl sulfate, sodium citrate, and the Tweens produced definite acceleration of this function.

The mechanism of expectoration is complicated: the ciliary mechanism, mucous secretion, cough reflex, and bronchial musculature all play a part. The contributions made by these various factors will not be discussed here. The correct clinical interpretation of the experimental findings probably is to assume that if an expectorant greatly *reduces* ciliary activity (by perhaps 50% or more), an alteration in its composition may be advisable. An expectorant should not necessarily be considered less useful because it *failed to accelerate* ciliary activity. From this aspect the substances here tested appear to be of uniform value. Other possible differences were not within the scope of the present study.

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Bilateral Thyrotomy Revaluation After Eight Years

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The first efforts to eradicate malignant disease of the larynx by thyrotomy, begun in 1870, were far from successful. Morrell Mackenzie [1] concluded from statistics of 15 years' observations that the results were extremely unsatisfactory and that it should not be attempted in cases of carcinoma of the larynx. However, Durham [2] was one of the first to show that the dangers were greatly overestimated and that thyrotomy should be more readily resorted to in appropriate cases. Curiously enough, these same men who were skeptical about it at first achieved brilliant results by this operation later. St. Clair Thomson [3] stated that thyrotomy has been further developed by such men as Semon, Butlin, Chiari, Koschier, Moure, Schmigelow, Delavan, and Chevalier Jackson. The indications for this operation were then well established, namely, a carcinoma situated in the anterior two-thirds of the larynx, limited to one cord and without its fixation. Good results are obtainable even if the disease has spread across the anterior commissure or extended upwards to the ventricle and ventricular band. However, one should have ½ in. of healthy tissue surrounding the tumor which is untouched by an instrument.

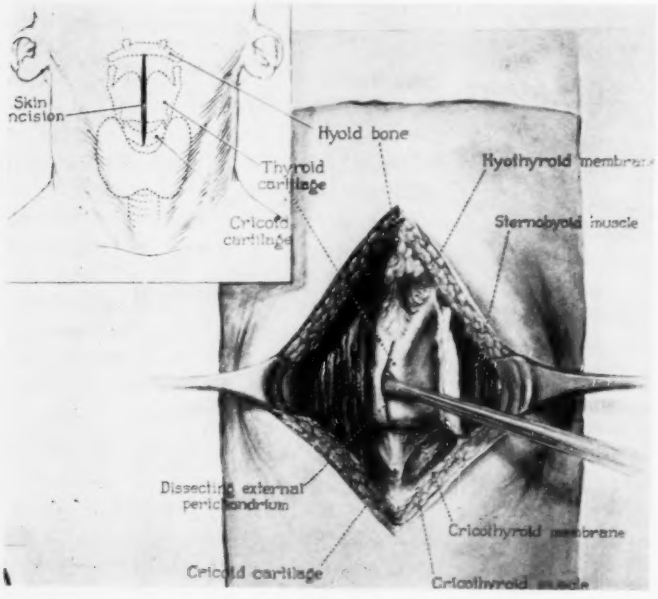

Fig. 1 (From *New England J. Med.* 244: 275-281, 1951).

Malignant growths of the larynx are usually squamous-cell carcinomata arising from the squamous epithelium of the anterior part of the vocal cord. These tumors progress slowly by extension and metastasize late.

Piersol,[4] describing the anatomy of the larynx, states that the cords arise by tendons

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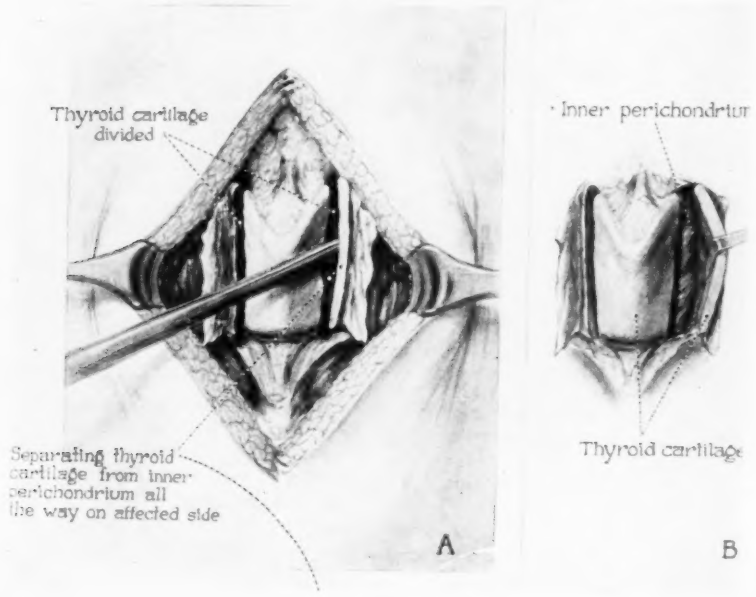
Fig. 2 (From *New England J. Med.* 244:275-281, 1951).

directly from the thyroid in the depth of the anterior angle by a common nodule or 1.5 mm. apart. These tendons begin above the false cords and extend below the true ones, and contain lymphatics and blood vessels. Laterally the perichondrium is not firmly attached to the cartilage. While the cartilages are highly resistant to the invasion of the tumor, the presence of the anterior tendons and their extension into the crista may explain some recurrences of carcinomata of the vocal cords following the midline incision. Where the carcinoma spreads downward, it may escape through the cricothyroid membrane. The bilateral thyrotomy extirpates these weak spots, together with the tumor and surrounding healthy tissue, en masse.

The operation has been written up previously, but to emphasize the various steps taken to facilitate the operation I will summarize the technique briefly.

The operation may be done either under local or general anesthetic, preferably the former. If local, the pharynx and larynx should be anesthetized thoroughly. This makes the operation go smoother, as the patient feels no pain and will allow the surgeon to work inside the larynx with ease. If general anesthesia is given, a low

Fig. 3 (From *New England J. Med.* 244:275-281, 1951).



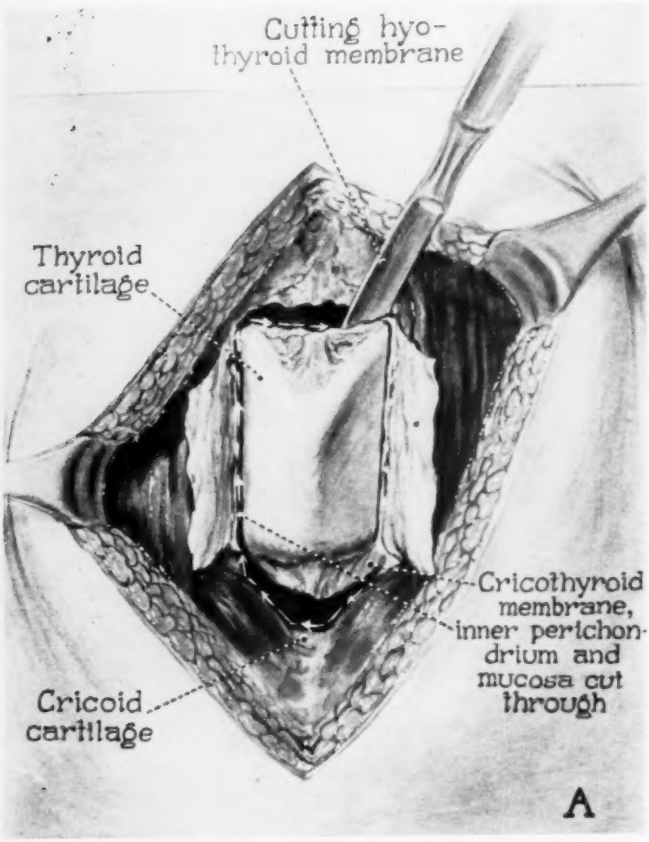


Fig. 4 (From *New England J. Med.* 244: 275-281, 1951).

tracheotomy should be done first to allow intubation of the trachea when thiopental sodium (Pentothal Sodium) is used.

A midline incision is made from the hyoid bone to just below the cricoid cartilage (Fig. 1). This incision is carried down to the thyroid cartilage without dissecting the flaps. The external perichondrium is incised in the midline and dissected on each side of the thyroid cartilage for 1 cm. The whole cartilage is then incised vertically on each side at this distance from the midline, leaving the crista with 1 cm. of cartilage on each side exposed or denuded of perichondrium (Fig. 2). These vertical incisions are made only superficially with a semisharp knife, and may extend to but not through the inner perichondrium. They are made only to designate the extent of cartilage to be removed. The inner perichondrium of the lower border of the thyroid cartilage is dissected away from the cartilage under the incision, and with a sphenoid punch or a small Kerrison mastoid rongeur a vertical trough is punched out at the line of incision of the cartilage. This exposes the inner pericardium without mutilation as might occur when a circular saw is used for this purpose (Fig. 3). The punch avoids the inner perichondrium, and no bleeding ensues. It also makes a wider defect in the cartilage so that a blunt periosteal elevator can be entered to denude the inner perichondrium with ease. It also serves as a hinge to fold over the anterior commissure and lay open the larynx for inspection and extirpation of the required mass.

The inner perichondrium on the involved side is next separated from the rest of the ala of the thyroid cartilage throughout its entire extent.

The inside of the larynx is further anesthetized by instilling a few drops of tetracaine (Pontocaine) 2% with a hypodermic needle through the cricothyroid membrane. This will prevent the patient from coughing when the larynx is opened. With the aid of suction, a horizontal incision is then made into the membrane along the upper edge of the cricoid cartilage from the involved

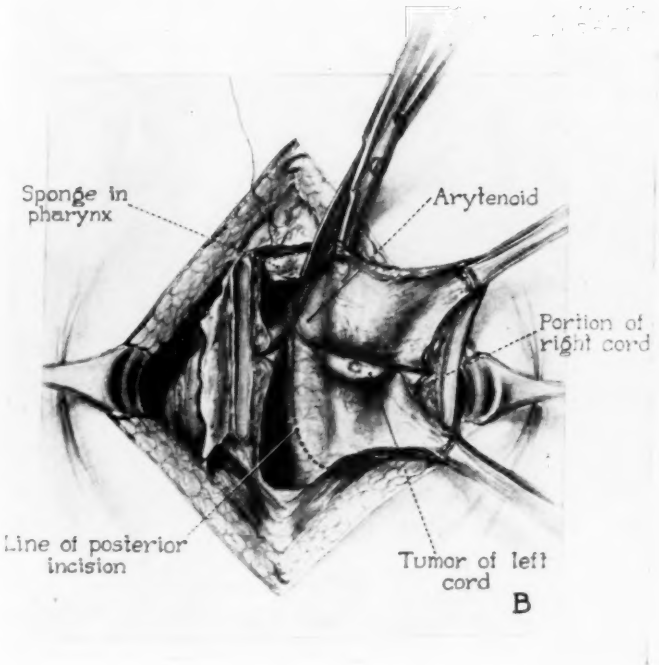


Fig. 5 (From *New England J. Med.* 244: 275-281, 1951).

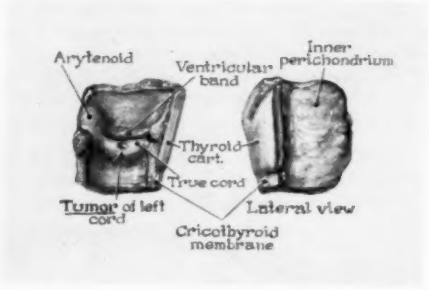


Figure 6

Fig. 6 (From *New England J. Med.* 244:275-281, 1951)

Fig. 7 (From *New England J. Med.* 244:275-281, 1951).

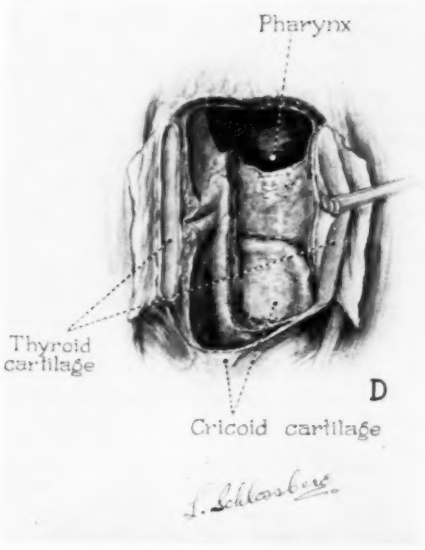


Figure 7

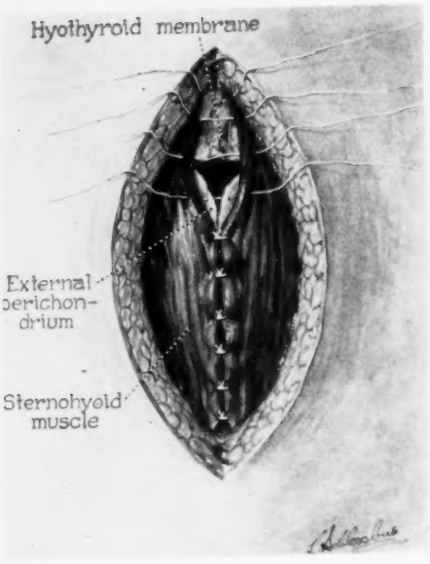


Figure 8

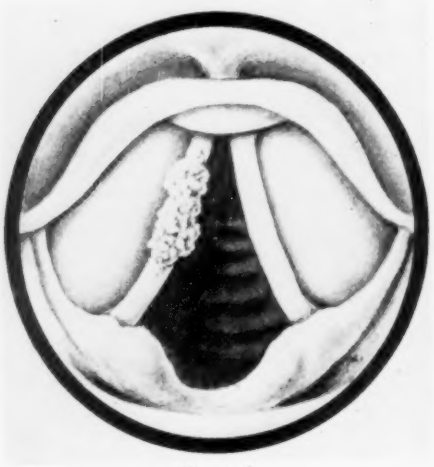


Figure 9

Fig. 8 (From *New England J. Med.* 244:275-281, 1951).

Fig. 9 (From *New England J. Med.* 244:275-281, 1951).

side to the opposite. With a blunt-ended, straight scalpel, the incision is continued upon the uninvolved side through the denuded inner perichondrium, up to the top of the thyroid cartilage, then across the thyroid notch to the opposite side (Fig. 4). The crista, with the 1 cm. of cartilage on each side, the inner perichondrium attached, is folded over, and the interior of the larynx exposed (Fig. 5). The neoplasm should be presented like a small mass of flesh on a large fleshy plate. A sponge with a string attached is placed in the pharynx to prevent saliva from entering the wound. Then, with straight and curved scissors, the entire mass, previously freed and now held in position by the upper rim of the thyroid cartilage on the involved side and posteriorly by the arytenoid cartilage, is cut out. Care should be taken to use a straight scissors along the whole upper rim, as a slightly curved scissors may cut downwards too quickly and go through the tumor. This mass consists of the cartilaginous crista with the anterior commissure, ventricular band, true cord, and tumor, with or without the arytenoid cartilage, and the cricothyroid membrane (Fig. 6). There should be no free edge of the cricothyroid membrane left as it will form a loose flap to impede the breathing (Fig. 7). Bleeding is now controlled by either pressure or coagulation. When the wound is dry, it is closed by suturing the outer perichondrium and the muscles with absorbable surgical suture, and the skin sutured over that (Fig. 8).

Tracheotomy is not necessary, but a low one can be performed now, if it has not already been done, in case of any doubt or apprehension as to bleeding or when the surgeon lives at a distance from the hospital. This should be extubated as soon as safety permits.

The patient is put to bed in a semirecumbent position, which makes cough and expectoration easier. He is given antibiotics for about four days. No opiates are given before, during, or after the operation. No food by mouth is given for 24 hours; only parenteral nourishment is allowed. Then begin slowly with liquids as the patient tolerates it. Strict silence is maintained for two weeks, after which the patient regains gradually a good useful voice. Soon after the operation, the patient is not restricted to bed, and the stay in the hospital is about 10 days.

The advantages of this operation are as follows:

A wide exposure of the inside of larynx is obtained.

The tumor, with a great deal of healthy tissue surrounding it, including the anterior commissure cartilage with the whole of the affected cord, and the cricothyroid membrane are removed en masse.

Bleeding is easily controlled.

Healing is rapid, with little or no reaction.

After eight years' observation of the patients in our clinics who have undergone the operation and from information received from surgeons who have been using this technique for a number of years, the fol-

Fig. 10 (From *New England J. Med.* 244:275-281, 1951).

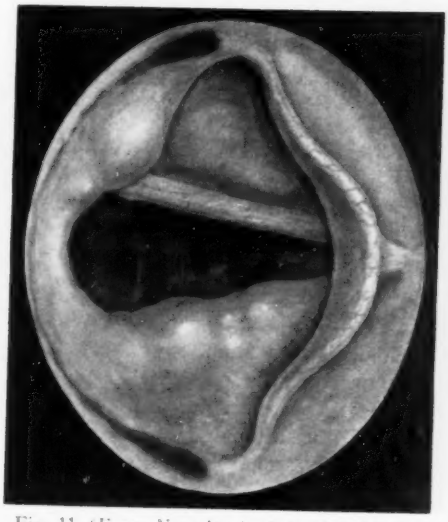


Fig. 11 (From *New England J. Med.* 244:275-281, 1951).

lowing conclusions can be drawn: The operation is ideal in the normal-sized larynx of men. The tumor should be limited to one cord without infiltration of anterior commissure and without the tumor crossing over to the opposite side (Fig. 9). It should be limited to the anterior two-thirds of the cord. The cords should be freely mobile, and no glands should be palpable. The operation is not adapted for women as their anteroposterior diameter is shortened. It is also questionable in men with short stocky necks and small larynges. These are the cases which may result in stenosis requiring a secondary operation or constant use of the tracheotomy tube. Otherwise, the results of the operation were good, with many five-year cures.

From one large clinic I was informed that 42 operations were performed without recurrences, 12 of them dating back five years or more. Many other sources have recorded five-year cures, although in proportionately smaller numbers, since sufficient time has not elapsed to render full reports. This operation, to my knowledge, has been widely performed successfully in properly selected cases. When the technique was strictly adhered to, there were no complications or recurrences. Figures 10 and 11 are drawings of larynges three years postoperatively—one after a very extensive carcinoma with the removal of the arytenoid; the other of one much les extensive.

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Bell's Palsy: A New Syndrome Associated with Treatment by Nicotinic Acid

A Guide to Adequate Medical Therapy

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Bell's palsy—facial nerve paralysis—has been defined as an ischemic palsy of the seventh cranial nerve. It is sympathetic paralysis, apparently due to a vasoconstriction of the arterioles of the peripheral perineural vascular channels of the seventh cranial nerve.[1]

There is usually a history of exposure to cold or draft on the affected side, although many patients will not recall such incidence of exposure.

It has been implied that a hyperactivity or activation of the sympathetic nervous system neuropathways will cause a vasoconstriction of the arterioles, which in many parts of the face will show no direct evidence of tissue involvement such as paleness of the underlying skin. If the small and none too plentiful arterioles of the seventh nerve are involved, the vasoconstriction will start a chain of events wherein ischemia, capillary dilatation, transudation, edema of the nerve and nerve sheath will occur, then associated loss of function, that is, paralysis, or Bell's palsy.

There may be some pain, although sensory changes in the nerve are seen primarily in the loss of taste, if the neurological sheath, swelling, and ischemia extend to involve the chorda tympani. Duel and Ballance[2] have illustrated this swelling and edema in many cases of Bell's palsy which were surgically explored and have surgically corrected and improved many cases by decompression of the main trunk. They also suggested that the vertical portion of the facial nerve to the stylomastoid foramen has a much poorer collateral blood supply than other portions of the nerve.

The physical findings of Bell's palsy are usually definite and concrete—a total paralysis of the affected side, with lack of muscle movement and tone of the forehead, eyelid, nose, mouth, and cheek, and the face seemingly having an "ironed-out appearance." The eyelid will not close; the corners of the mouth will sag, and the lips will draw to the nonparalyzed side. The patient will be unable to whistle, smile, close eye, or wrinkle forehead on the affected side. Other associated findings are the following: (1) loss of taste on affected side (chorda tympani); (2) alteration in hearing (stapedial muscle paralysis); (3) watering of eye and inability to close eye; (4) dryness of eye if neuron swelling extends to geniculate ganglia, altering lacrimal gland secretion; (5) pain in the muscles or tingling sensations over the course of the seventh nerve peripheral distribution; may also include the posterior auricular area (muscle sensory nerve).

In establishing a true diagnosis of Bell's palsy we must rule out all other causes of facial nerve paralysis. Some of these are listed:

1. Otitis media—mastoiditis Bezold's abscess.
2. Otitis externa—furunculosis, ear canal or region which can cause paralysis, by localized inflammation on the course of the nerve or at the stylomastoid foramen.
3. Traumatic injury.
4. Tumors along the intracranial roots. If supranuclear lesion is present, there will be some muscle movement in forehead and incomplete paralysis. Acoustic neuroma may

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give infranuclear findings, but its cause is insidious and not abrupt.

5. There should be careful evaluation of patient in general, regarding heart and blood pressure, to rule out these possibilities. Stroke or embolic phenomena or arteriosclerotic ischemia.

In Bell's palsy findings of all other nerves but the seventh are negative. Careful study of the neurological pathways can be done quickly and accurately. Movement of eyes, tongue, palate show no abnormal alteration.

To be considered a true "Bell's palsy" there must be no other causative elements than the evidence of a neurovascular vasospasm of the nerve blood supply with ischemic paralysis. This paralysis will be total in character.

Having considered what Bell's palsy is and its mechanism, what is the usual course of this condition? There seems to be a lack of reports in the literature regarding a normal untreated prognostic course. Mettler,[3] in describing a motor nerve paralysis, shows that after injury the nerve in 48 hours begins a definite alteration or degeneration and that in two weeks this degeneration is completed. Usually faradic stimulation shows no response after this time. Also any regeneration which occurs, usually 1 mm. per day in growth, would imply a minimum of 80 to 90 days to expect recovery if uneventful. There is a need for more knowledge on exact recovery, if any, of an untreated Bell's palsy.

Skolnik[4] reports on electrical stimulation of the seventh nerve with faradic and galvanic currents. He reports a series of 15 cases with variations of recovery with a minimum recovery period of three weeks (three cases), four recoveries in four weeks, four recoveries in five weeks, and the remainder, three, extending three months or more with 40% or less recovery, and one case with no recovery found. This would suggest that 11 of 15 cases would require an average of one month to have an average of around 20% to 50% recovery. It might be noted that many of these cases were seven days (and more) before initially seen. The findings of Skolnik fall in line with the degeneration illustrated by Mettler.[3]

In my experience of seeing patients who have had Bell's palsy (untreated) more than a year before I have examined them, three to six months was the established period which most of the patients described as passing before any recovery was noted. It could be seen in most of these patients that at best 50% of nerve function was present.

Sullivan and Smith[5] in their report suggest this course might be shorter (3 to 12 weeks to show recovery).

It is possible, if the vasospasm is of short duration, that patients might recover spontaneously without the facial nerve reaching the degenerative stage.

Treatment

The treatment of Bell's palsy has in recent years evolved around two methods—medical and surgical.

The medical treatments advocated have been toward the fundamental dysfunctional phase or cause of the condition. Skinner[6] and Good[7] have considered and used histamine or vasodilating drugs with good results where treatment was established early, the histamine being used to create a vasodilatation of the involved vessels. Hilger[8] reported using a preparation of nicotinic acid, monoethanolamine nicotinate (Nicamin) and procaine also for the same purpose. The reported results were estimated as up to 85% recovery.

Surgery was recommended for those where medical response was poor, and some authors[2,9] feel early surgical decompression should be done.

In my experience, when certain criteria are utilized as a treatment guide, surgery has been found unnecessary. In 74 consecutive cases (1947-1957), all had excellent results, with no treatment failures to date.

It is the purpose of this paper to bring out these criteria and the associated syndrome when medical treatment with nicotinic

acid (unmodified) is used, showing an excellent working outline of treatment.

Clinically, Bell's palsy has certain working stages when the patient is first seen.

Stage 1.—Onset. Vasoconstriction occurs, reduced circulation, ischemia to nerve, increased intracellular and extracellular swelling, more decreased circulation. This will result in loss of function of the nerve, both afferent and efferent impulses. It might be noted here that the motor nerve appears to go out first and returns last, while the sensory nerve may function earlier in the healing process. Paralysis is the primary finding in this stage. The nerve will start to degenerate after two or three days.

Stage 2.—Beginning Degeneration. Wallerian degeneration in a damaged nerve is inevitable unless immediate restoration of circulation is obtained. It reaches its maximum in 8 to 12 days. Cloudy swelling may last two to three weeks, at which point the degeneration is irreversible. If a nerve is cut, most change is seen in three to four days.[4]

Stage 3.—Stage of Irreversible Nerve Damage. The nerve must repair itself completely after 14 to 21 days and beyond. Repair begins immediately —1 mm. per day along old channels if the nerve has to regenerate from point of injury. It may take four to six months to complete this repair.

In the method of treatment with nicotinic acid it is possible to alter the duration of these three stages and also to prognosticate the course of recovery. If the patient is seen early in the course of this condition, Stages 2 and 3 rarely occur.

Treatment Pattern.—Treatment must be started immediately when diagnosis is established, preferably on the day of onset. For a quick return of function it means initiating therapy within two days of onset or during Stage 1. If this is done, return of facial motion will occur within seven days. Of the 74 cases treated, 39 were first seen within this period, and in every case beginning movement was established within the seven-day period. There was complete recovery within 14 days from onset.

Of those seen in Stage 2, i. e., 3d to 13th day (33 cases), most were treated within the 3d to 5th day, and one was a delayed case with a 10-day onset. These all had excellent beginning movement within 10 days, and full recovery within three weeks. The delayed case responded after 15 nicotinic acid treatments in approximately 18 days after onset of treatment and less than one month after onset of paralysis.

One patient was seen in Stage 3, two months, after paralysis onset. Partial movement was present 21 days after treatment was started and after 15 injections had been given. This patient had approximately 80% facial movement recovery but the result was not considered as good as in cases seen in Stages 1 and 2.

The patient seen in Stage 3 is one who was treated for two separate episodes of Bell's palsy. She was first seen after a paralysis of two months' duration. This was on the right side of her face, following a draft on the face. After one month, movement was present in its maximum as reported above (or three months) after onset. Six months later, she reported to me on the first day with a paralysis on the other side (left side). Treatment was instituted at once, and recovery was obtained in two weeks. The apparent paralysis was the same in each case, but early treatment would seem to indicate an earlier response to treatment. This is an excellent oportunity for comparative studies of similar conditions on the same patient. If the right side might indicate spontaneous recovery other than by treatment, then the left-side recovery might indicate value in such therapy. Incidentally, movement on the left side of the face recovered completely, but on the delayed therapy side, recovery was only 80%.

Criteria in Treatment.—To treat Bell's palsy one must depend upon obtaining a physiological flushing dose. This dosage of nicotinic acid given intramuscularly has no relationship to body build, weight, size, or height. A heavy person may take 100 mg. and a small frail individual 250 mg. daily. Each patient is started on an initial dosage of 100-150 mg. in one intramuscular injection and the reaction is observed. If the face and skin on the body show marked flushing, then the correct maintenance dose is found.

A *pallor syndrome* is seen in many of these patients at the peak of the flushing. The paralyzed side of the face will not flush like the normal side and gives an impression of pallor in the area of the distribution of the external maxillary artery. This is usually seen on the first few injections and will disappear as total flushing occurs.

This syndrome is a helpful guide as to prognosis in the treatment as well as to confirm the presence of a vascular spasm in other blood vessels in the same general area. Perhaps the same sympathetic constriction of the arterioles of the facial nerve also affects the other arterioles in the face on the same side.

As a prognosticating sign this syndrome is very useful. With the progression of these treatments the pallor diminishes in size and usually disappears after the third or fourth injection, and the face flushes evenly thereafter. It is quite possible to tell the patient that in 24 hours there will be an increase in tone on the paralyzed side of the face. In about two days there will be a twitching, suggestive of nerve stimulation attempts. If there is taste loss, it will begin to return at about the same time. When the tone in the facial muscles is noted, it is possible to predict better than 60% return of function in seven days, the return being gradual to normal thereafter. The lips usually return more quickly, while raising the corners of the mouth and blinking the eyelids are usually the last to improve, taking about two weeks. This syndrome is seen best if the patient is started on therapy in Stage 1, that is, within two days of onset. It is more difficult to demonstrate, but pallor has been seen on some patients first examined in Stage 2.

Toxicity

The toxicity of nitcotinic acid is essentially that of extreme vasodilatation. The dosage might seem intensive, but it is held only at the amount necessary to obtain the proper flush and vasodilatation. In all of the cases seen, no severe reaction of any type was encountered except in one patient. This patient had a history of "migraine" headaches. The physiological flushing dosage recreated the type of headache which was described as his migraine type. This was not considered a severe reaction, and treatment continued until paralysis of the face was overcome. Undoubtedly, this patient had a vascular dilatating type of headache for the migraine.

I have not had the occasion to treat a patient with Bell's palsy by any other method of therapy since this procedure has been instituted. No cases were prolonged sufficiently to require surgical decompression. All of the 74 consecutive cases (except 1) gave excellent facial nerve response to the point where the casual observer would be unable to point out which side of the face was paralyzed. One exception was the patient first seen in Stage 3, where response was present but only approximately 80% recovery noted.

The patient, as well as receiving daily 100-250 mg. the established physiological flushing dose, was given nicotinic acid tablets 50 mg. t. i. d. for home use (except the last 15, who were given a combination of meclizine and nicotinic acid [Antivert, Roerig] t. i. d. They were instructed to keep out of drafts, protect the eye with an eye shield and to give the muscles on the paralyzed side some mild massage.

It has not been necessary to recommend electric stimulation or to give corticotropin (ACTH), procaine, or histamine, as other authors have recommended, mainly because of the dramatic results obtained by this present technique. A delay in reporting this syndrome and results was mainly to thoroughly evaluate the conclusions which could be established by a large number of consecutive cases.

It might be noted here that most of the patients (72 out of 74) were seen within five days of onset. It is very unusual to have the opportunity to see cases like these so early in a referral type of practice; there-

fore, much credit should be given to my professional collagues for being on the alert and cooperating so readily. This certainly illustrates the fact that the more quickly this condition is diagnosed and treatment instituted, the faster and more thorough the response to treatment.

Summary

A series of 74 consecutive Bell's palsy cases are reported, which were treated by 100-250 mg. nicotinic acid, with excellent results noted within two to four weeks.

A comparison of treatment methods is made by utilizing paralysis stages as noted in the paper.

A new syndrome is noted, in which a definite pallor on the paralyzed side is seen when the physiological flushing dose is obtained for the rest of the body and normal side of the face. This syndrome is seen mainly if treatment is started within two days after onset.

By use of this syndrome it is possible to give treatment prognosis.

810 South A St.

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Method for Collecting Samples of Endolymph from the Vestibular Canal Without Contamination

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Histological sections of the organ of Corti show in some cases a very pronounced outward bending of Reissner's membrane and in other cases just the opposite, namely, an inward bending. This has brought up the question of whether or not a disease of the inner ear may produce a pressure variation in the endolymphatic duct. If such a pressure variation were present, it should show up in the chemical content of the endolymphatic fluid.

Interest in this question was enhanced by the findings of Smith[1] and Smith, Lowry, and Wu,[2] who found that the chemical constitution of the endolymph is quite different from the constitution of other body fluids.

The question today is this: Are inner-ear diseases a consequence of changes in the chemistry of the endolymph or are inner-ear diseases rather produced by changes in the cell structure of the organ of Corti? A differentiation of the inner-ear diseases in these two groups would give possible clues for treatment.

Unfortunately the variation in the position of Reissner's membrane in histological sections does not provide sufficient evidence of a chemical change in the endolymph, since a simple change in the method of histology may also produce variations in the position of the basilar membrane.

The aim of this paper is to describe a method for taking samples of endolymph from patients whose labyrinths have to be destroyed, as in Ménière's disease, and also from normal or diseased animals.

Since the fenestration operation technique permits the exposure of the lateral canal, in our experiments the endolymph was collected from the canals during this procedure. Of course there is no proof, as yet, that the endolymph in the canal, the utricle, and the cochlea is the same. However, the method described should make it possible, eventually, to determine whether or not differences exist between the endolymph in different parts of the labyrinth in animals.

Several methods already have been developed to collect samples of endolymph. The most direct approach is the introduction of a capillary into the inside of the labyrinth and the use of suction for collecting the sample. This method was used in 1940 by Aldred, Hallpike, and Ledoux,[3] by Ledoux,[4] and by Citron and Exley.[5] The difficulty with this technique is that the suction may also suck in perilymphatic fluids along the surface of the tip of the capillary. This is especially so in labyrinths with endolymphatic fluids of much higher viscosity than that of the perilymph. In this case the suction pressure has to be quite high in order to overcome the viscous forces of the endolymph. Otherwise, a long time would be needed to take a sample. To avoid these difficulties Lempert, Wever, and Lawrence[6] tried a completely different method. They hooked a thread around the canal and tried to tie it tight. In tying a thread around the canal it is seldom possible to squeeze the walls of the canal so tightly together that the lumen of the canal is completely closed. The inner stiffness of the thread precludes its bending to the necessary small radius.

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From the Lempert Institute of Otology and Lempert Research Foundation, New York.

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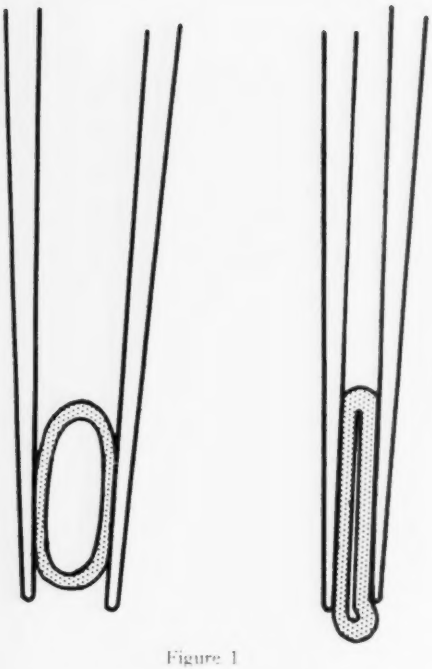

Figure 1

In the following method a simple tweezer, instead of the tie, was used to close the canal.

As Figure 1 demonstrates, a complete closure of the canal is obtained only if the tip of the tweezer extends below the lower edge of the canal. The forces acting on the tweezer tip can be made strong enough to guarantee a complete closure of the canal. The method used to take samples was to

Figure 3

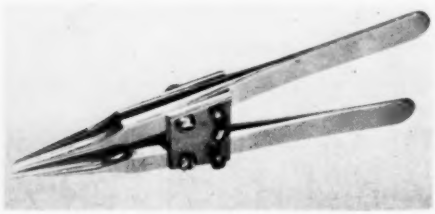

Figure 2

combine two tweezers in such a way that a section of the canal was closed on two points, and then by lifting out both tweezers simultaneously this section of the canal was taken from the patient during the operation, or from the labyrinths of the experimental animals.

Figure 2 shows the combination of the two tweezers. The arms of the two tweezers were connected by a metal plate in such a way that they actually form one tweezer with two clamps. The four set-screws in the corners of the trapezoidal metal plate are used to adjust the tips of the two tweezers so that they close simultaneously. The center screw on the right side is used to screw all the four tips together, once the canal has been taken out of the labyrinth.

The angle between the two tweezers and the distance between the tips can be adjusted easily so that the tweezer system fits in the operative opening during the fenestration. Figure 3 shows how the tweezer is properly held.

If the tweezer system is used in a human patient, the axis of the operative opening is not perpendicular to the axis of the canal. This is especially so if the labyrinth is opened to expose a longer section of the canal, and the fenestra on one side almost reaches the ampulla. In such cases, to be able to clamp the canal properly, one tweezer, namely, the tweezer close to the ampulla, has to be positioned lower than the other. This situation is demonstrated in Figure 4 on a human temporal bone in which the tip of the tweezer on the left side is displaced below the tip of the tweezer on the right side by the distance $\triangle$. By doing so, the tweezer system can be adjusted

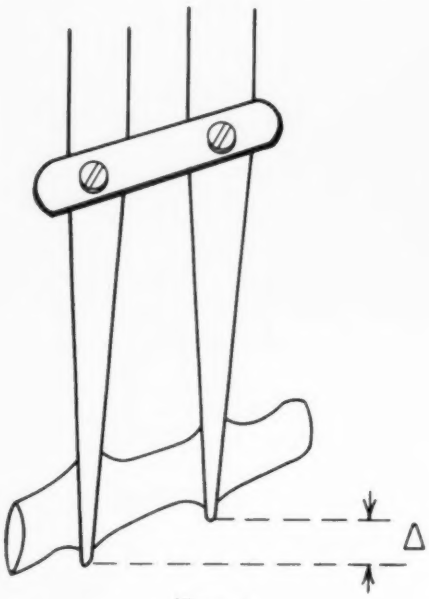

Figure 4

to any curvature and the angle of the canal inside a given operative opening. The adjustment of the displacement △ between the two tweezer tips can be done with the help of the set-screws seen in Figure 2.

There was no difficulty in bringing the tweezer system into the right position relative to the canal, as can be seen in Figure 5. Once the tweezers are in proper position, they are clamped together with the fingers and taken out from the fenestra. This maneuver tears off the closed section between the tweezers from the rest of the canal and lifts out the section, as demonstrated in Figure 6, a canal of a human labyrinth. Both ends are tightly closed, and the endolymph is sealed in the canal.

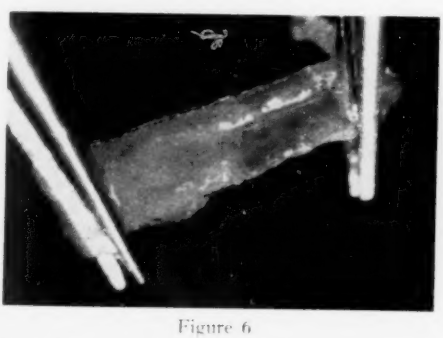

Figure 6

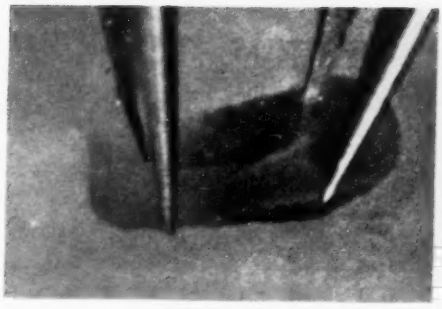

Figure 5

In this way, a section of the canal is ready for further manipulations. To avoid any drying up of the canal, the tweezer system with the canal was immediately immersed in liquid petrolatum (paraffin oil). To take out the endolymph the tips of the tweezer were opened and the cut-out canal section was allowed to fall to the bottom of a Petri dish filled with liquid petrolatum. One way to collect the endolymph from the canal section is to squeeze the canal against the bottom of the dish with a blunt pick. In this way, if one side of the canal is kept closed with a simple tweezer, a drop of endolymph will be squeezed out from the other end of the canal. A light jerk on the canal is usually enough to separate the drop sitting on the end of the canal from the walls of the canal. This is shown in Figure 7, the canal of a pigeon. On the right side the squeezed-out endolymph drop is visible and on the left side the flattened part of the canal section. The bottom of the Petri dish was covered with a sheet of Teflon.

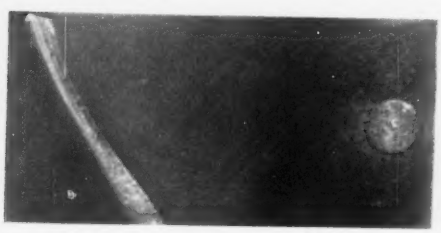

Figure 7

Figure 8

This material is inert to most chemical substances and it has the proper capillary affinity so that a drop of endolymph suspended in liquid petrolatum does not spread out on the surface of the Teflon sheet as it would on the glass surface of the Petri dish. If Teflon is not used, the endolymph can spread out on the glass surface to such a degree that it is almost invisible.

Figure 8 shows on the right side how a drop of endolymph of a pigeon starts to spread laterally. If by any accident this happens, it is generally possible by the use of a Teflon spatula to collect the fluid from the glass surface so that it again forms a round drop in the liquid petrolatum, which then can be pushed so that it lies above a Teflon surface.

We do not yet have a final schema for storing and manipulating the drop of endolymph once it is under oil. To store it, perhaps a good method is to freeze it with solid carbon dioxide, or it may be better to suction up the drop in a capillary and use it from there.

Under oil it is easy to dilute the endolymph by adding a given amount of fluid. The volume of the endolymph can be determined from the diameter of the drop formed by the endolymph.

Another method would be to freeze the section of the canal, at once, when it is still clamped between the tweezers.

Summary

A method is described which permits the sealing off of a section of the vestibular canal and lifting it out of the labyrinth so that the endolymph in it can be collected without contamination by other labyrinthine fluids.

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Audiology Section

Joseph Sataloff, Associate Editor

Recruitment A to Z

The ABC Test for Recruitment (Bilateral)
The XYZ Test for Recruitment (Unilateral)

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The purpose of this article is to give the practicing otolaryngologist an understanding of recruitment and a rapid screening test to determine the presence or absence of recruitment.

First let me say that recruitment is that characteristic of the nerve deafness in Ménière's disease which makes these ears sensitive to loud sounds. These ears are so sensitive that the patient cannot understand loud voices. Furthermore, these ears are sensitive to minute changes in intensity of sound, and the pitch becomes distorted.

Recruitment may be better understood if one visualizes the endolymphatic hydrops of Ménière's disease, producing dilatation of the aqueduct of the cochlea. This dilatation stretches the fibers of the basilar membrane. In the piano theory of hearing, these fibers of the basilar membrane have been compared to the strings of a piano. Continuing the comparison, when the fibers are stretched in Ménière's disease, the nerves are "on edge"; the sounds are distorted; the ear is "out of tune." Further, the longer fibers of the low tones are stretched more and are more out of tune. All of this produces the scientific diagnosis an "end-organ nerve deafness with recruitment." The patient will better understand the diagnosis as a "sensitive nerve-end deafness."

The presence or absence of recruitment is therefore a valuable aid in the differential diagnoses of deafness. The tests which I am about to describe will in a few moments give the busy otolaryngologist an accurate clinical opinion of the existence and degree of recruitment.

Equipment

No special equipment is needed to test for recruitment. Anything which will produce a loud sound in one ear can be used to test for recruitment. This may be loud spoken voice, a loud tuning fork, the patient's hearing aid, a single receiver audiometer, or the right and left receiver audiometer. When any of these methods demonstrate sensitivity to loud sound or distortion of words at high intensity, they indicate the presence of recruitment.

In the tests to be described we have used the standard audiometer with a microphone and binaural headset. (A single receiver could be used with improvisation.) The binaural headset permits the shifting of the sound from one ear to the other and the masking of one ear while the sound is introduced into the other.

The ABC Test for Recruitment

The ABC test for recruitment is designed to utilize the basic information of

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Fig. 1.—The ABC test. The photographs indicate the patient's response when the letters A-B-C are repeated with increasing volume, first in the right normal ear, then in the left recruiting ear.

The sound is soon heard with equal intensity in both ears; here at 40 db. At the 80 db. level the sound is uncomfortably loud in the right ear but intolerably loud in the recruiting ear.

The patient with recruitment will usually wince and pull at the headset when loud sounds are introduced into the involved ear.

the binaural loudness balance tests, uncomfortable loudness level, speech discrimination tests, and in a few moments give the practicing physician worth-while clinical information necessary in the diagnosis and treatment of the otological condition.

In the ABC tests the letters ABC are repeated first to the right ear and then in the left ear (Fig. 1). The patient is asked to describe which is the loudest and which is the clearest and to report differences in pitch. Beginning at threshold, this is repeated in 10 and 20 db. steps to the 100 db. level. The patient is asked to report when the sound becomes uncomfortably loud, and intolerably loud. The patient is asked to report difficulties in understanding.

Table 1, Column 1*a* shows the recording of the ABC tests in a patient with normal hearing. The threshold is indicated by the *small letters;* the patient begins to understand at the 20 db. level with hearing the same in both ears (abc-abc). At the 80 db. level the sound becomes uncomfortably loud; this is indicated by *capitalization* (ABC-ABC). At the 90 and 100 db. level the sound is still heard the same in both ears; the patient still understands clearly, as indicated by the continued recording of the three letters ABC-ABC.

TABLE 1.—*Results of ABC Test*

Db.	1 a Normal		1 b Lt. Cond. D		1 c Lt. S. Nerve (Recruitment)	
P. O.	Rt.	Lt.	Rt.	Lt.	Rt.	Lt.
20	abc	abc	abc		abc	
40	abc	abc	abc	a . .	abc	abc
60	abc	abc	abc	abc	abc	abc
80	ABC	ABC	ABC	abc	ABC	ABC-D
100	ABC	ABC	ABC	ABC	ABC	AXX XXX

Shows the recording of the ABC test as the letters A-B-C are repeated with increasing intensity in first the right and then the left ear. In the normal ears (1 *a*) note that with increasing volume there is gradual increase in size of the letters abc—abc—ABC—ABC. In the left conductive deafness (1 *b*) note that sound is always louder in the normal right ear, as indicated by the relative size of the letters. In the left sensitive nerve deafness (with recruitment) note that the sound is soon heard with equal loudness abc—abc, and that there is rapid loss of descrimination at the 90 and 100 db. level, as indicated by the AXX and XXX.

Fig. 2.—The XYZ test. The photographs indicate the patient's response when the right normal ear is masked and the letters X-Y-Z are repeated with increasing volume in the left ear.

The sound is heard faintly at the 40 db. level. At the 80 db. level the sound becomes intolerably loud and loses intelligibility.

Recruitment is indicated when there is decreasing intelligibility with increasing volume.

Column 1*c* indicates the findings in the case of normal hearing in the right ear and a 40 db. sensitive nerve-end deafness (end-organ) in the left ear. The threshold in the right ear is indicated by the small abc-ooo beginning at the 20 db. level. The threshold in the left ear is indicated by the abc-abc at the 40 db. level. At the 80 db. level the uncomfortable loudness level is reached in both ears, as indicated by the capitalizations ABC-ABC-D. Note that the sound has rapidly become equally loud in both ears as indicated by the same size of the capital letters ABC-ABC and note that the patient states that the pitch is different in the left ear, the diplacusis being recorded with the ABC-D. At the 80-90-100 db. level there is progressive loss of clarity in the left ear as indicated by the AXX and XXX. Also the sound is now louder in the deaf left ear than it is in the right ear, this hyperrecruitment indicated by the relative size of the capitalizations. At the 100 db. level the patient hears only loud, garbled sound in the left ear. The patient volunteers that he can hear but cannot understand and cannot tolerate the noise. Recruitment in the left ear is then indicated by (1) narrowing of the threshold-uncomfortable loudness gap, (2) the sensitivity to sound in the left ear, (3) the distortion of sound in the left ear (diplacusis and speech discrimination), and (4) at maximum intensity there may be relatively greater loudness in the deaf ear (hyperrecruitment).

The XYZ Test

The XYZ test is a unilateral test for threshold, uncomfortable loudness level, and decreasing speech discrimination. The normal right ear is masked, and the three letters XYZ are repeated in the involved left ear from the threshold to maximum intensity (Fig. 2). Figure 2 illustrates that with masking of the right ear the sound is first heard in the left involved ear at the 40 db. level and the sound becomes intolerably loud at the 80 db. level. Threshold is recorded in small letters xyz and the uncomfortable loudness level by capitalization XYZ (Table 2), and decreasing discrimination is recorded with Xs as XYX for partial and XXX for total loss of discrimi-

TABLE 2.—*Results of XYZ Test*

Db.	RT.	LT. Normal	LT. Cond. D.	LT. S. Nerve (Recruitment)
20	70M	xyz		
40	70M	xyz		
60	70M	xyz	xyz	xyz
80	70M	XYZ	XYZ	XYZ
100	70M	XYZ	XYZ	XXX

In the XYZ test the normal right ear is occluded with 70 db of masking (70M). In the normal left ear note that the patient appreciated the gradual increase in volume (xyz — XYZ — XYZ — XYZ). In the left conductive deafness there is the same gradual increase, but at a lower level. In the left sensitive nerve deafness (recruitment) there is rapid increase in the appreciation of volume (xyz—XYZ) and there is rapid loss of discrimination (XXX).

TABLE 3.—*Results of ABC and XYZ Tests as Recorded on Audiogram Form*

	Right	Left		Left
0				
20	abc		Left Severe Recruitment	
40	abc	abc		xyz
60	abc	abc		xyz
80	ABC	ABX-D		XYX
	ABC	AXX		XXX
100	ABC	XXX		XXX
	250	500 1000	2000	4000 8000

The ABC and XYZ tests are recorded with a red and blue pencil on the standard audiogram form and the clinical opinion written in the available space.

nation (Table 2). A more detailed impression of discrimination may be obtained by repeating additional letter combinations, as ABC, EFG, LMN, PDQ, etc. When, with increasing volume of sound there is such distortion that the patient can no longer understand simple alphabetical combinations, then that patient has recruitment.

The purpose of any test is to obtain the maximum cooperation of the patient without confusing him. Although a longer test gives more statistical information, I can hardly get my patients with recruitment to tolerate the 50-word list at the 70 to 100 db. level. I believe that the mathematical picture is not as important as the otologist's clinical judgment as to whether or not recruitment exists, and if so, the degree—slight, moderate, marked.

Recording

The ABC test and the XYZ test are recorded on the standard audiogram form as shown in Table 3. The clinical opinion is written in the available space.

Pure-Tone Audiometry

The typical audiogram in true Ménière's disease is a flat audiogram, and early in the disease there is retained hearing for high tones (Table 3). There is similar loss in bone conduction. Between tests there may be a variation of 10, 20, or 30 db. in the threshold of hearing. The pressure of the endolymphatic hydrops makes the ear sensitive to loud sound (recruitment) and produces distortion (diplacusis); in early remissions these findings are absent.

In making the audiogram, the patient receives the sound very suddenly and is aware of the slightest variation of sound. The audiogram is easy to do; there is no indecision about threshold. This fine-line audiogram is characteristic of recruitment in the Békésk audiometer. The difference limen test shows that these ears can differentiate intensity even to a fraction of a decibel.

If in making the pure-tone audiogram a sound at 80 db. intensity is suddenly introduced into the involved ear, the patient will wince with discomfort. This will not be true in the normal ear.

Scientific Rectitude

The bilateral ABC test for recruitment is based upon the binaural loudness balance test. In addition, it will show diplacusis, closure of the threshold-uncomfortable loudness gap and will demonstrate loss of speech discrimination. The unilateral XYZ strate closure of the threshold-uncomfortable loudness gaps. Understanding of the ABC and XYZ tests will be clarified with test is based primarily on the speech discrimination tests, but it will also demon- a brief description of the basic tests for recruitment.

1. *Binaural Loudness Balance.*—In the binaural loudness balance test, the sounds are produced first in the good or right ear, and then in the poor or left ear. In a 50 db. left conductive deafness there is a constant 50 db. difference in the two ears as the volume is increased from zero to the 100 db. level. In 50 db. sensitive nerve-end deafness with recruitment the sound is soon heard with equal loudness in both ears, and very loud sounds may be heard louder in the deaf ear—the phenomena of hyperrecruitment.

2. *Uncomfortable Loudness Level* (threshold-uncomfortable loudness gap).—In recruitment the ear becomes sensitive to loud sound. In a normal ear there is about an 80 db. gap between threshold and uncomfortably loud sounds. The same 80 db. gap persists in conductive deafness. In sensi-

tive nerve deafness the sound becomes uncomfortably loud soon after it is heard.

3. *Speech Discrimination.*—In the ear with recruitment there is distortion of sound with increase in volume. With speech tests, the recruiting ear will understand at the threshold, but the louder the sound is, the less the patient understands. That is why these patients have great difficulty wearing a hearing aid.

4. *Difference Limen and Difference Difference Limen Tests.*—Slightly above threshold the normal ear can differentiate intensity differences of about 2 db. The ear with recruitment is so sensitive that it can differentiate intensity differences of a fraction of a decibel. This is the basis of the difference limen test.

With a 30 db. increase in volume from 10 db. above threshold to 40 db. above threshold the normal ear shows increasing ability to differentiate minute variations in intensity from two fractional decibel variations. The ear with recruitment is already so sensitive at 10 db. above threshold that with the 30 db. increase it does not show the great reduction in difference limen. This is the basis of the difference difference limen test.

Experience

For the past several years we have utilized the ABC test and the XYZ test and find close correlation between these tests and the above-described tests. This correlation exists in degree and diagnosis. When the physician does the brief ABC and XYZ tests, he has the advantage of observation of the patient, leading to understanding between the patient and the physician and permitting the physician to exercise his clinical judgment as to the presence or absence of recruitment.

Conclusion

The purpose of this article is to advocate that the otologist, himself, make a few simple speech tests to form a clinical opinion in regard to the presence or absence of recruitment and its degree. The words or letters used are not important; the bilateral ABC-ABC and the unilateral XYZ are simply my method of recording on the audiogram form whether or not the patient can understand the loud voice without discomfort or distortion.

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Psychological Characteristics of the Audiologically Inconsistent Patient

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Estimates of the incidence of functional involvement in patients referred to military audiology centers have varied from 8% to 35%.[1,4-7,9,11] Such patients, though usually possessing a true organic loss, require careful and complex audiological testing in order to establish their actual degree of hearing loss. Typically, they show audiograms which vary widely from day to day, demonstrate internal inconsistencies, such as gross discrepancies between hearing for pure tones and hearing for speech, or they reveal peculiarities during special testing.

Various writers[4,5,8,11] have commented on the psychological meaning of such behavior during audiological evaluation, but few specific or systematic formulations exist to account adequately for the phenomenon, and no quantitative psychological data have been presented in the literature. Inconsistency, almost without exception, represents an exaggeration of the actual hearing loss, and it is therefore necessary in a military setting to comprehend the psychological meaning of such behavior so that the implications for future behavior can be understood.

Such inconsistent behavior during audiological testing which results in an exaggerated hearing loss is common at the Audiology and Speech Center of Walter Reed Army Hospital.[1] It is important, therefore, to examine these inconsistent patients psychologically to determine what personality factors characterize them. A clear understanding of their abilities, motivations, and goals can be quite useful in working with these patients and in aiding them to demonstrate their true hearing level during audiological examination.

This study is designed to investigate through various psychological techniques the personality structure of patients demonstrating audiologically inconsistent behavior. This will be done by comparing the personality of these inconsistent patients with patients displaying routine and consistent audiological behavior.

Procedure

The method of establishing the two populations under study is essentially a judgmental and clinical one. While rigid standards for assignment to one or the other group could be possible on the basis of fixed and arbitrary differences between level of loss on successive audiograms or on the basis of certain arbitrary internal characteristics of the audiogram, it is felt that such a procedure is less valid and less valuable than a clinical evaluation. The highly skilled audiologist is capable of making more meaningful assignments than any purely mechanical system, since the clinician can integrate a wide variety of cues into an essentially more accurate estimation of audiological consistency.

The supervisor * of the Hearing Evaluation Section of the Audiology and Speech Center at Walter Reed Army Hospital undertook to make judgments of such audiological testing behavior on consecutive and unselected male inpatients admitted during a seven months' period. For obvious rea-

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* This study was made possible by the cooperation of Miss Josephine Walker.

sons, patients suffering from Ménière's syndrome or chronic otitis media were not included in this study. Psychological data were available on 278 patients. The audiologist carefully examined the audiological testing data on each patient and then placed him in one of two categories—(*a*) routine and consistent or (*b*) inconsistent. The decisions regarding inconsistency, as previously indicated, were based on a variety of reasons, the chief being internally inconsistent audiograms, widely discrepant tests from day to day, or peculiar and suspicious behavior on special tests. A large percentage of these patients were eventually tested by the psychogalvanic method. The end-point of repeated testing was a hearing loss of a less degree than originally indicated.

The psychologist had available the results of a group-administered battery of psychological tests and data from an individual psychological interview. This information represented the quantitative and qualitative indices to the personality structure of the patients involved in the study. The group tests included a test of intellectual functioning, Shipley-Hartford Retreat Scale,[10] and three personality tests—the Cornell Index [12] Form N2, the Psychopathic Deviate (PD) scale of the Minnesota Multiphasic Personality Inventory,[2] and the Self-Attitude Scale.[3] The Shipley-Hartford Retreat Scale provides an over-all sampling of the patient's vocabulary skills and conceptual ability, while the Cornell Index inventories the number of psychiatric and psychosomatic complaints. The PD scale of the Minnesota Multiphasic Personality Inventory (MMPI) investigates, primarily, the social values of the patient and his past social behavior. The Self-Attitude Scale is a projective sentence-completion test in which the patient is invited to complete various fragmentary sentences and thus reveal his inner preoccupations and attitudes.

I also had available the data from a 10- to 30-minute individual psychological interview. During this interview the psychologist explored the past social history of the patient, his current problems, his system of values and goals, and his attitudes toward his hearing loss.

As an index to the later adjustment of some of these patients† to their hearing loss, I arranged that behavioral ratings of their rehabilitation performance while at the Center be given by rehabilitation workers. These ratings essentially indicate whether any particular patient succeeds or fails during the period of rehabilitation training.

In summary, the study seeks to determine the relationship between consistency of behavior during audiological evaluation and certain psychological functions, including later adjustment to the hearing loss.

Results

Table 1 demonstrates the frequency of organic hearing loss in the audiologically inconsistent patient. Since the great majority (86%) of patients are medically diagnosed as possessing some degree of hearing impairment, it follows that the inconsistency, in most cases, represents an exaggeration of an already present organic loss. In the remaining 14% no final evidence of any organic hearing defect was found. These results are similar to those of Johnson [4] who also noted that functional involvement is most usually associated with a true organic hearing loss.

TABLE 1.—*The Incidence of a Medically Diagnosed Organic Hearing Loss in the Audiologically Inconsistent Patient*

Group	No.	Percentage
Organic pathology	72	86
No organic pathology	12	14

Table 2 shows the incidence of inconsistency during audiological testing to be 30%. Thus, almost one of every three patients coming to this Center for initial evaluation demonstrates a nonorganic overlay. These findings are in essential agree-

† Of the originally tested patients, 209 demonstrated a sufficiently serious organic loss to warrant being given a period of hearing rehabilitation.

ment with those of Albrite and Shutts[1] for a different and earlier period at this same Center. These figures, while generally higher than those previously reported, probably represent an increasing sophistication of audiological techniques rather than any essential change in the patient population.

Table 2 indicates that consistent patients, as a group, perform significantly higher on a test of intelligence than do inconsistent patients. Since military populations are selective for intelligence, this suggests that the inconsistent group has a higher percentage of patients with low intelligence. Table 2 also demonstrates that the audiologically inconsistent patient shows a significantly greater number of psychiatric and psychosomatic complaints than the consistent patient. The results of the PD Scale reflected in Table 2 show similar significant trends in that the inconsistent patients show a greater degree of antisocial philosophy and behavior. In summary, Table 2 reveals that the inconsistent patient performs in a less intelligent manner, has more psychological complaints, and is less bound by the ethical values of the culture in which he lives.

Table 3 indicates that inconsistent performance during audiological examination is significantly related to later rehabilitation performance at this Center. The χ-square value is far above the 1% level of confidence. Transformation of this table into percentage units shows that while 52% of the inconsistent patients do not make a successful adjustment to their hearing loss, only 12% of the consistent patients fail at rehabilitation.

TABLE 2.—*Psychological Test Performance of the Two Groups*

Test	Inconsistent Mean	Inconsistent N	Consistent Mean	Consistent N	σ_{dm}	t
Shipley-Hartford IQ	99.49	84	105.26	194	2.64	2.18 *
Cornell Index	17.34 ‡	84	9.88	194	1.91	3.91 †
MMPI PD Scale	17.42 ‡	82 §	15.82	182 §	0.75	2.13 *

* Significant at the 5% level of confidence.
† Significant at the 1% level of confidence.
‡ The higher score in the direction of psychological pathology.
§ The number of patients vary, since some did not complete all tests.

TABLE 3.—*χ-Square Analysis of the Rehabilitation Performance of the Two Groups*

	Inconsistent	Consistent	Total
Rehabilitation success	16 *	153	169
Rehabilitation failure	17	21	38
Total	33	174	207

$df=1$, $\chi^2=26.23$ † $P<0.01$.

* Numbers indicating the frequency of patients in each category.
† Yates correction for discontinuity included.

Comment and Conclusions

The foregoing statistical findings enable us to state that the audiologically inconsistent patient is also a member of a psychologically deviant group. The phenomenon of inconsistency during audiological evaluation is not an isolated one but is related intimately to the general personality structure and current life situation of the patient. This group is identified as *deviant* but not necessarily as being psychiatrically ill. The use of group statistics tends to mask individual differences and does not allow the exploration of intragroup differences. What of the individuals? Are they, without exception, psychologically pathological? Group statistics do not provide an answer. Accordingly, the author offers the following presentation on the basis of a qualitative study of the testing data and clinical psychological interviews.

While the psychological pathology is grossly apparent, the trouble in approximately 55% of these cases of audiological inconsistency seems to be, primarily, one of emotional immaturity and instability rather than a clear-cut case of psychiatric illness. These patients appear to have experienced difficulty living up to the demands of the larger society for responsible and mature behavior. Their hearing loss is used, largely on an unconscious level, to gain some favored goal, or as an explanation to society that they are not to blame for their inadequate social performance.

Although there is a minority of outright cases of malingering, most of these im-

mature and unstable patients appear to experience the loss on an unconscious and thus hysterical basis. Essentially, these patients represent disorders of character and typically they demonstrate many of the following characteristics: (1) poor motivation for service in the military, (2) dissatisfaction with progress or assignment in military service, (3) hypochondriacal thinking, (4) chronic failure in interpersonal relationships, (5) a generalized feeling of frustration and bitterness, and (6) a history of failure in school. It is interesting to note that in view of the past history of school failure, they do quite poorly during rehabilitation and contribute the large majority of the rehabilitation failures.

The most frequent goal of this group is to manipulate the military service into giving them a medical discharge and financial compensation for the hearing loss. The next most important unconscious goal is to impress society with the unreasonableness of its demands and the harm that such demands is causing them as "handicapped" persons. Thus, these individuals characteristically ask for transfers to favored locations or changes in assignment so that little responsibility or efficient competitive performance may be expected of them. The third unconscious goal is to blame their handicap for various social failures, such as poor performance in school, lack of military achievement, and repeated interpersonal failures such as those in marriage.

These personality elements are reflected by the psychological test battery given at this Center. This group includes a number of intellectually dull individuals who lower the average intellectual level of the group. The hypochondriacal thinking, the generalized sense of frustration and pessimism, and the difficulties with relationships reflect themselves in the high scores on the Cornell Index. Finally, the impoverished social values and the history of social strife are shown in the pathological MMPI PD scores.

There is also another large group showing inconsistent audiological testing. These patients comprise about 30% of the total inconsistent group and appear to be primarily neurotic in nature. While generally well disposed toward military service and society in general, they possess internal conflicts to an uncomfortable and crippling degree. These are the oversocialized personalities who constantly strive to earn the respect of society and to escape social criticism. They frequently feel inferior and inadequate, anxious or depressed, tense and under constant pressure. Some appear to be hysterical, often successfully converting anxiety into a physical symptom. Others, while being basically hysterical, are less successful in handling anxiety, and they often seem disorganized, anxious, lacking in self-confidence, and unable to concentrate on presented stimuli. The combination of these elements contributes towards an extreme variation of responses and results in a serious audiological inconsistency. All such behavior largely stems from unconscious determinants and there is no question of malingering in such patients.

On psychological testing, these neurotic patients often show above-average intelligence on the Shipley-Hartford Scale. On the Cornell Index they receive pathological scores because of their tension, anxiety, feelings of inferiority, and their reliance on psychosomatic complaints. Their MMPI PD scores are usually normal.

The third group of inconsistent patients seems devoid of obvious psychological pathology. These patients, comprising 15% of the total, reveal no particular complaints. They seem well adjusted socially, and in general are psychologically indistinguishable from the general population. The meaning of the exaggeration in this group is not easily apparent and it is deserving of further intensive study. An oddity, and probably one worthy of further investigation, is the fact that half of this group, despite normal intelligence, have experienced difficulty at some time in academic work at school. This in itself may be suggestive of some latent instability which may have been exacerbated

by the hearing loss. At any rate, the emotional pathology, if present, is subtle and resistive to the short-term psychological examination employed at this Center.

In conclusion, there seem to be three distinct psychological classes within the inconsistent group which meet the challenge of the audiological examination with variability of response. The mechanism causing the exaggerated loss seems usually unconscious in nature. Disorganized anxiety patterns and an inability to feel confident in their responses complicate the reactions of neurotic patients.

Summary

An attempt was made to determine the psychological characteristics of patients presenting inconsistent audiological response patterns. The consistency of the audiological testing of 278 consecutive military patients at the Audiology and Speech Center of Walter Reed Army Hospital was rated by a skilled audiologist. Thirty per cent of these patients revealed inconsistencies during audiological testing which resulted in an exaggeration of their hearing loss. In 86% of the patients such functional overlay was associated with a medically diagnosed organic hearing loss. The personality structure of these inconsistent patients was studied by psychological testing and personal interviews. When compared with a group demonstrating routine and consistent patterns during audiological testing these patients showed poorer intellectual performance, a greater degree of psychiatric and psychosomatic complaints, and deviant social behavior and ethical patterns. Performance during a period of rehabilitation training was studied, and, according to behavioral ratings made by rehabilitation personnel, these audiologically inconsistent patients present a high failure rate in adjusting to their hearing loss. When examined carefully, the group is seen to be heterogeneous and composed of three psychological subclasses. The largest element demonstrates emotional immaturity, instability, and an inadequate response to social demands. The next largest group is a neurotic population high in anxiety and feelings of inferiority and lacking in self-confidence. Often these patients seem to be anxious as well as hysterical, and the anxiety contributes to the variability of response. There is a third small group, seemingly normal psychologically, which needs further study in order that the inconsistent behavior and exaggerated loss can be understood. All three groups appear to experience the exaggeration largely as an unconscious process, although there were a very small number of apparent malingerers. Thus, the phenomenon of audiological inconsistency seems closely associated with a generalized personality disturbance and is most probably one manifestation of the disturbance.

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Case Reports

Von Recklinghausen's Disease of Nasopharynx

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In 1822 the famed German pathologist, Friedrich D. von Recklinghausen, first described a condition known as neurofibromatosis, or multiple neurofibromata of the skin. Since that time, the same tumors have been described involving practically all of the visceral nerves. This peculiar and often familial condition usually presents itself as large numbers of tumors, sometimes hundreds, growing from fine cutaneous nerves so that the condition is known as multiple neurofibromata. The skin type forms soft nodules which may be located over the entire body. There are also pigmentations or patches which are not the nodular type and which present themselves as brown spots or freckles, commonly referred to as being "café au lait" spots. The condition may be quite disfiguring to the patient; however, these tumors are usually benign in character. The deeper growths are the most dangerous because of their space-occupying effect and are more prone to undergo sarcomatous change, being a frequent cause of death. This change occurs in 10% to 15% of multiple lesions and to a considerably smaller degree in single lesions. A neurofibrosarcoma is similar clinically and microscopically to a fibrosarcoma. Acoustic nerve tumor and meningioma have been associated with this condition in the past.

Histologically the characteristic tissue has a tangled or reticular structure, with a fibromatous-type picture of varying extent with palisades and whorls of ill-defined, evenly stained nuclei and connective tissue. The tissue often undergoes a jelly-like hyaline degeneration. Microscopically it would appear that in von Recklinghausen's disease all of the elements composing the nerve are involved to some degree. The incidence of neurofibromatosis is relatively rare, occurring about once in every 2000 to 4000 hospital admissions. It is twice as common in males as in females and is seen in all races, generally developing in adults. Neurofibromata, whether single or multiple tumors, are almost always located along the course of the nerve from which they derive. They are well encapsulated, moderately firm, measuring from few to many centimeters in diameter, and have a tendency to undergo liquefaction, necrosis, and cyst formation. The diagnosis of a single neurofibroma is generally made pathologically while that of neurofibromatosis is made from the gross appearance of a tumor. The latter may be confused with multiple lipomas. The general consensus as to treatment of this condition is simple excision for the single tumors, while treatment for the multiple lesions is removal of those which are thought to be undergoing malignant transformation. The prognosis depends upon the location of the growth and the presence or absence of sarcomatous change. The etiology of this tumor is not entirely known; it is considered to be a benign tumor originating from the cells that cover the nerve fibrils. Whether these cells are mesodermal in origin and therefore fibroblasts or whether they are epidermal in origin and thus Schwann or neurilemma cells, is still debatable. The proponents of the latter theory refer to the lesion as a neurilemmoma, neurinoma, or schwannoma.

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Report of a Case

An 8-year-old white boy was first seen by his family physician for an upper respiratory tract infection. A primary diagnosis of tonsillitis with a possible peritonsillar abscess of the left side was made. The patient was treated with antibiotics and saline gargles. Although the infection of the throat improved, the mass persisted in its size. It must be mentioned that surgical drainage was not attempted. One week after the recognition of this mass, the patient was referred to Charity Hospital of Louisiana, at which time he was seen in the Ear, Nose, and Throat Department.

Physical Examination.—Examination revealed a well-developed, well-nourished white boy, appearing to be his stated age. Examination of his face revealed multiple coffee-colored splotches, not unlike freckles, over the facial area. On talking to the child it was noted that his voice was heavy, with a nasal quality. He was not hoarse. Ear and nose examination was negative. Examination of the throat revealed a rather large prominence of the left lateral pharyngeal wall. The extent of this mass was approximately 2.5 cm. in width and about 6.5 cm. in length. It was rubbery-firm to palpation. Superiorly it extended to the cushion of the left Eustachian tube orifice; medially, to the midline of the pharynx, laterally to the area just posterior to the posterior pillar, and inferiorly to the lowest level of the oropharynx. Laryngoscopy failed to reveal laryngeal or hypopharyngeal involvement by the tumor mass.

At this time in speaking to the mother it was noted that she had small nodular growths over her face and arms. She stated that she had had these nodular growths as long as she could remember. She denied any history of the disease in her grandparents or parents. She had six other children, and these children were all free of freckles or disease similar to her own. She was ignorant of her own particular condition.

Upon closer examination of the child it was seen that he had "café au lait" spots over his entire upper trunk and back. He had a plexiform type lesion, just inferior to his left breast, a fibromatous lesion involving his right nipple.

Hospital Course.—The patient was admitted to the hospital, at which time routine laboratory work-up was entirely negative. Complete x-ray survey failed to reveal any evidence of visceral or peripheral tumors. Blood chemistries were within normal limits. A presumptive diagnosis of von Recklinghausen's disease was made. Dermatology consultants were asked to see the patient and they concurred in this diagnosis. Patient was brought to surgery, at which time, under general anesthesia, a small section of the medial portion of the pharyngeal lesion was taken for biopsy and

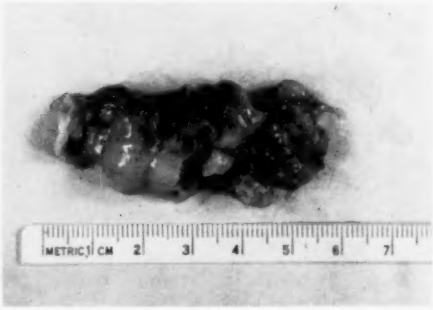

Figure 1

the dermatologist took biopsy specimens of the left breast lesion and of a lesion on the child's back. The pharyngeal lesion upon biopsy revealed itself to be quite firm, gritty in nature, and quite avascular. Histological sections were obtained from these specimens with the following results: The pharyngeal lesion was a neurofibroma, that on the back a plexiform neurofibroma, and the chest lesion a neurofibroma. A histological diagnosis was thus obtained.

Treatment.—It was decided, after the histological examination that this pharyngeal mass should be excised, because of its location and potential danger. Although the patient gave no history of dysphagia or nasal regurgitation, it had already impaired his voice. Approximately one week after the first biopsy the patient was brought to surgery, placed in a supine position, and endotracheal anesthesia was instituted. A combination of nitrous oxide and thiopental (Pentothal) sodium anesthesia was used because of the probable use of the electrosurgical unit. A mouth gag was inserted, and by means of a palatal retractor, the superior extent of the lesion could be well visualized. The soft palate was split just left of the uvula to facilitate excision of the superior extent of the pharyngeal lesion. It was noted that the lesion was quite adherent to its mucosal covering, and a submucosal excision was impossible. The entire mass was circumscribed about 0.5 cm. from its border, and by means of sharp and blunt dissection the lesion was freed easily from the deep fascia and excised. Bleeders were clamped and ligated. The entire area was electrocauterized, both at its base and lateral extents. After a dry field was ascertained, the soft palate was closed. The patient tolerated the procedure well. On the day of surgery he was given supplemental intravenous fluids and allowed to have cold liquids that evening. He developed no complications from the surgical procedure, was able to eat soft foods two days postoperatively, and a regular diet one week postoperatively.

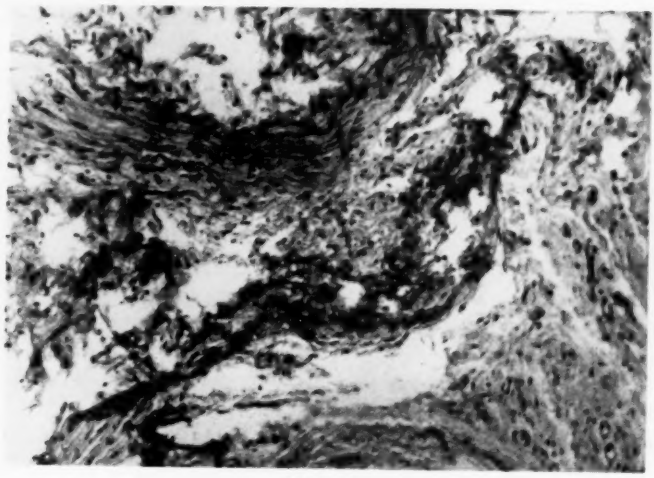

Figure 2

Follow-up.—The patient was seen at weekly intervals, at which time epithelialization of the pharyngeal mucosa had begun. At the end of one month complete epithelialization had taken place, with no evidence of tumor growth in the entire area. The patient's voice at this time had a much improved quality, losing its nasal tone, and the patient gave no history of complaints. Serial histological sections of the lesion were made, and no sarcomatous changes were noted. The entire lesion was representative of a neurofibroma.

Summary

A case is reported of a symptomatic pharyngeal neurofibroma, which resulted in a case of von Recklinghausen neurofibromatosis in an 8-year-old child. The pathological picture of the disease is reviewed. There have been many case reports of neurofibromatosis involving the different cranial nerves, especially the vagus and hypoglossal. The exact nerve in this case cannot be directly pinpointed; however, the lesion did follow the distribution of the left glossopharyngeal. The treatment was surgical excision and electrocauterization of the base. It was apparently successful. In a six months' follow-up there has been no evidence of recurrence of the lesion and the entire area is completely healed.

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Progress in Otolaryngology

Tumors of the Nose and Throat

Summaries of the Bibliographic Material Available for the Years 1953 to 1956

KENNETH D. DEVINE, M.D., Rochester, Minn.

(Concluded from page 761)

Salivary Glands

The most striking change in the surgical attack on lesions of the parotid gland in the last 10 years has been the trend toward the replacement of enucleation of pathological swellings without formal exposure of the facial nerve by techniques in which the facial nerve and its branches are deliberately exposed and preserved as a preliminary to bold, wide, and often total removal of the gland. Patey [458] described the techniques of conservative and radical parotidectomy in detail. Conservative parotidectomy provides a weapon for dealing with cases of recurrent parotitis. This is a good article written by someone who appreciates and understands parotid surgery.

Devine, Figi, and Beahrs [459] hoped for fewer recurring parotid tumors in the future because of the wide acceptance of the belief that every parotid tumor should be removed early and the general practice of wide surgical exposure of the gland, early exposure of the facial nerve as it comes out of the stylomastoid foramen, and the performance of subtotal or total parotidectomy rather than extracapsular enucleation. In spite of the precautions, however, some parotid tumors will continue to recur because of the nature of the tumors in this region and the human desire to avoid facial deformity.

Ariel, Jerome and Pack [460] described the indications and techniques for surgical extirpation of parotid neoplasms which they have developed on the basis of the surgical anatomy of the parotid salivary gland, the anatomy of the facial nerve, the lymphatic drainage of the parotid salivary gland, and the natural history of neoplasms arising from this organ. The role of irradiation in the treatment of parotid neoplasms was described, and it was emphasized that radiation therapy should not be used as a crutch for inadequate surgical removal.

Blocker, Lewis, and Snyder [461] routinely used irradiation after removal (or incomplete removal) of all malignant lesions of the parotid gland; first they rolled the overlying skin flap on itself away from the tumor site and secured it to the adjoining malar skin with loose interrupted sutures. The radium needles were inserted in the parotid region. After 4 to 10 days, when the needles were removed, the flap was unrolled and replaced over the defect.

Brintnall, Tidrick, and Huffman [462] recommmended that total parotidectomy be adopted as the routine surgical procedure for parotid tumors. The facial nerve and its branches need not be sacrificed for benign lesions.

Utendorfer [463] recorded his experience with total parotidectomy with preservation of the facial nerve on 23 patients with benign tumors of the parotid gland. Superficial lobectomy was not recommended. The facial branches were identified at the anterior margin of the superficial lobe and traced in centripetal direction.

Perhaps one of the greatest deterrents to the adequate management of malignant tu-

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mors of the parotid gland has been the fear of injury to the facial nerve.

Conley [464] stated that when it has been necessary to resect the entire parotid gland and facial nerve, an immediate nerve graft should be carried out by the implantation of the contralateral great auricular nerve into the face. The nerve regenerates in 9 to 15 months.

Lathrop [465] stated that the possibility of permanently injuring the facial nerve while excising a tumor of the parotid gland can be almost entirely eliminated if the facial nerve is isolated before any effort is made to remove the tumor. If the facial nerve is severed, the patient need not necessarily be afflicted with a permanent paralysis of the face. Suturing the severed ends of the nerve together when possible or utilizing an autogenous nerve graft to repair the defect when end-to-end suturing is not possible will afford satisfactory relief from the facial palsy. The great auricular nerve and the femoral cutaneous nerves are most suitable as donor nerves. A single through-and-through silk stitch of 6.0 gauge is used to approximate the nerves.

Some degree of paresis will appear in practically all cases of exposure of the facial nerve. In order to avoid permanent injury to this structure, it is necessary to expose more or less of it in every operation. Perzik [466] noted that this paresis is about 50% complete in 2 hours, 75% in 24 hours, and reaches its maximum in 48 hours. The paresis usually appears first in the lower lip, then in the upper lip, forehead, and eyelids, and disappears as a rule in the opposite sequence. If no nerve has been severed, recovery in one day to two years can be anticipated in all cases, regardless of the severity of the paresis or the age of the patient.

Kidd [467] stated that the recurrence rate for mixed parotid tumors can be reduced to nil by total parotidectomy with preservation of the facial nerve. The facial nerve can be preserved and will recover its function in every case. The cause of the Frey syndrome is not known. It occurred in 11 of the 45 patients in his series. In 10 an attempt was made to section the auriculotemporal nerve at the time of operation. In one of these a complete Frey syndrome developed.

Gustatory sweating (Frey syndrome) following operations on the parotid gland may be prevented, according to Coldwater,[468] by section of the auriculotemporal nerve or the facial anastomotic fibers at the time of the primary operation.

Hamberger and Laage-Hellman [469] listed the special complications which can be expected to arise after parotidectomy as temporary facial paralysis, permanent partial paralysis, salivary fistula, and the auriculotemporal syndrome. In 44 cases these complications have not shown themselves to form any contraindication for the operation.

Davis and associates [470] presented a critical analysis of the anatomy of the facial nerve and parotid gland. This paper should be read by all interested in parotid surgery.

Lyle [471] stated that all parotid tumors should be removed surgically as soon as discovered. The true pathological condition is revealed only by microscopic pathology. Frozen section should be made at the time of operation. One operating on parotid tumors must be qualified in the surgical procedures used and must have a thorough knowledge of the anatomy.

Day and Hall [472] reported 12 cases of parotid tumor seen at the Guthrie Clinic and Robert Parker Hospital from 1945 through 1952.

Fleming [473] reported 123 cases of tumors of the salivary glands treated at Grace-New Haven Community Hospital from 1922 to 1952. The parotid gland was the most frequent tumor site. All tumors subjected to biopsy recurred, with three exceptions.

Maxwell, Buxton and French [474] reviewed the records of 280 patients with neoplasms of the parotid glands. It was found that in 67 instances neoplasms previously interpreted as being malignant were placed in the group of benign tumors. They desig-

nated cylindromas as pseudoadenomatous basal-cell carcinoma and pointed out their malignant character by saying, "It has been a difficult tumor to manage." This study did not disclose any factors which have seemed to be conducive to malignant changes in benign tumors of the parotid glands. In their series of five mucoepidermoid carcinomas, each responded well to wide local excision.

Lucas, Newman, and Klopp [475] reported a series of 50 cases of parotid tumors. Of these, 40% were malignant; 60% were benign. They emphasized that the "watch and wait" policy should not be followed in cases in which a lump is present in the parotid gland.

Smiddy [476] reported his experience with 80 cases of mixed parotid tumors treated by various methods, mainly by conservative excision and some form of radiotherapy. The tumor recurred in 24 cases. The more radical type of excision is now advocated.

Papayannopoulos and associates,[477] and Jerome [478] reported a series of 42 and 97 cases of parotid tumor respectively.

Hunter [479] presented a series of 30 cases of mixed tumor of the parotid treated by enucleation and postoperative radiotherapy. He concluded that enucleation and postoperative radiotherapy is a satisfactory form of treatment with a low recurrence rate.

Perzik [480] emphasized that so-called mixed encapsulated parotid tumors should be excised by subtotal or total parotidectomy. Microscopic study of the periphery of such tumors reveals that the "capsule" does not fully encapsulate; hence, enucleation and less radical procedures may leave neoplastic tissue behind.

Tabah [481] advocated exposure of the facial nerve at the stylomastoid foramen and a complete superficial parotidectomy for most benign tumors.

Ross [482] maintained that it is possible to perform total parotidectomy and keep the deep lobe and superficial lobe together and still preserve the facial nerve.

Levine [483] recommended total parotidectomy for recurrent mixed tumors.

Redon, Fitzgibbon, and Matthews [484] presented a good discussion of the "handling" of parotid tumors.

Foote and Frazell's [485] and Frazell's [486] presentations of their experiences with tumors of the major salivary glands should be read by all interested in tumors of the nose and throat. These papers are major contributions to the literature.

Godwin [487] reported the clinicopathological features in 27 cases of acinic-cell adenocarcinoma of the parotid gland. The term "acinic" cell was employed because of the apparent origin from the serous cells of the acini of the parotid gland. Examination of these tumors revealed them to be composed of cells closely resembling normal serous cells. These tumors occurred slightly more commonly in females and most frequently in the fourth and sixth decades. Clinically they simulated mixed tumors and generally had a long course with recurrences in 50% of the patients. Metastasis to lymph nodes occurred in one case and to other organs in four cases. Godwin concluded that treatment of the primary tumor appears to be excision with a good margin and an intact capsule. Dissection of the nodes in the neck does not appear to be indicated.

Benign lymphoepithelial disease of the parotid gland consists of a diffuse, multicentric process involving the whole gland on one or both sides. Recurrence should be anticipated after local excision. Freund and Jonassen [488] stated that the disease probably arises from lymph nodes within the parotid which contain ductal structures. If diffuse involvement of the parotid is found, the treatment of choice is radiation. This condition seems to be sensitive to radiation.

Shellito and Stofer [489] reported a case of bilateral benign lymphoepithelial tumor of the parotid glands.

Lorimer [490] stated that lymphoepithelial lesions of the parotid gland probably are inflammatory and represent the parotid counterpart of Hashimoto's disease of the

thyroid gland. Treatment is by surgical excision or small repeated doses of roentgen rays.

Kay [491] presented the clinical and pathological features in three cases of lymphoepithelial lesions of the major salivary glands. The resemblance of these lesions to Mikulicz's disease is emphasized. It is as yet not clear whether the lesion is inflammatory or neoplastic.

Recurrent parotid swelling can be on either an infectious or allergic basis. Recurrent infection with the mumps virus is unlikely. Riley [492] reviewed the problem of recurrent parotid swellings and discussed the pathogenesis and immunological responses.

Bailey [493] reported a case of bilateral parotid swellings.

Wawro, Fredrickson and Tennant [494] presented a series of 10 hemangiomas of the parotid gland in the newborn and other infants. Microscopic studies indicated that this is a benign lesion and has a slower growth potential after four to six months of age. Surgical excision is proposed as a definitive and safe procedure. Out of nine patients operated on, three had recurrences. Three of the nine patients were less than 4 months of age. The facial nerve was sectioned in one patient, and one died postoperatively.

Edwards and associates [495] and Cody [496] presented single cases of hemangioma of the parotid gland.

Wheelock and Strand [497] reported 12 cases of papillary cystadenoma lymphomatosum. They were of the opinion that this tumor may be a developmental anomaly and that heterotopic epithelial elements of the salivary gland may be stimulated to secrete a granular precipitate.

Sedgwick and Sass [498] reported a series of 21 patients with papillary adenocytoma lymphomatosum seen at the Lahey Clinic during the past eight years. Treatment was surgical excision. There was one recurrence in the series.

Jorgensen [499] reported finding a malignant melanoma of the parotid gland in a 77-year-old woman. The primary lesion was not found.

Schafer, Gruet, and Jackson [500] by reporting an oncocytic adenoma brought the total of acceptable authentic cases to 17. The salient features as presented in the literature were reviewed briefly.

Boley and Robinson [501] reported a case of bilateral oxyphilic granular cell tumor of the parotid gland and Berkheiser and Clough [502] reported a similar tumor (oxyphilic adenoma) of the parotid.

Hughes [503] reported two cases of multiple parotid tumors. In one a mixed tumor and an "adenolymphoma" were present; but in the other two separate nodules both of which were mixed tumors were discovered on removal of the parotid gland.

Baker and associates [504] reported a case of bilateral mixed tumors of the parotid gland. A review of the literature revealed that only five cases had been reported previously.

Lenson and Strong [505] reported a case of simultaneously occurring mixed tumors of the right parotid and the homolateral submaxillary gland.

Smith, Gratiot and Simard,[506] and Beyer, Blair, and Hamilton [507] reported a case of sarcoma and one of adenocarcinoma of the parotid duct, respectively.

Gilman, Schwartz, and Gilman [508] reported a case in which a nodule was found by fatty infiltration of the parotid gland; the condition could not be differentiated clinically from a mixed tumor.

Short and Pullar [509] reported a case of giant parotid tumor and tabulated other similar cases from the literature.

Falkinburg and Fagan [510] presented a case of malignant mixed tumor of the parotid with metastasis in the subcutaneous tissues of the tip of the left middle finger.

Gross and Friedman [511] reported a case of parotid tumor with cerebral metastasis.

Snitman, Thurston, and Romanski [512] presented the case of a patient, age 6 years, with

a mucoepidermoid tumor of the parotid gland.

Johnson[513] discussed the pathology and natural history of neoplasms arising in the salivary glands and reviewed the significant clinical features in 180 cases.

Conerly and McSwain[514] followed 64 patients with mixed tumors of the salivary glands for an average of 11.3 years; the recurrence rate was 30.6%. The average time between operation and recurrence was 7.5 years. To them five years seemed too short a time to denote cure of mixed tumors. They stated that these tumors are sometimes of multicentric origin and that the recurrence is not always a persistence of the original tumor but actually a new one. The longer the period of follow-up the higher the recurrence rate.

Edvall[515] reported results of treatment of 330 tumors of the mucous and salivary glands with preoperative teleradium followed by operation in three to six weeks. Follow-up revealed recurrence in 1.2% of the benign group and in 12.8% of the malignant group. Extirpation or enucleation of the tumor had been the routine operation. When dealing with malignant tumors he operated without considering the facial nerve. In cases in which the surgeon was convinced that he had performed a radical operation recurrences did not develop; but in those cases in which the report tells of uncertainty often recurrence developed after a short time.

Vellios and Davidson[516] grouped salivary gland tumors into four categories: (1) benign lesions; (2) malignant tumors with slow clinical course; (3) malignant tumors with a rapid clinical course, (4) incidental tumors not peculiar to salivary gland.

Out of a group of 900 tumors of major salivary glands seen at Memorial Hospital, New York, 57 were classified by Foote[517] as malignant mixed tumors. These tumors are four times as frequent in the parotid as in the submaxillary salivary gland and were not seen in the sublingual glands. The most frequent patterns seen in malignant tumors are those of adenocarcinoma and epidermoid carcinoma, and these are often seen in combination. The most typical clinical history associated with malignant mixed tumors is one in which the patient has been aware of a mass for several or many years.

Thornton, Hennigar, and Kay[518] examined 100 tumors of the salivary glands. Carcinoma was found in two mixed tumors of long standing.

Salivary gland tumors are among the most variable of all tumors in histological composition. The most controversial group is "mixed" benign or malignant tumors, according to the *Cancer Bulletin*[519] (of Texas). Many benign mixed tumors undergo malignant transformation. Although numerous features are helpful in the differential diagnosis of major salivary gland tumors, positive diagnosis can be made only by biopsy.

Woolner, Pettet, and Kirklin[520] studied 36 mucoepidermoid neoplasms of the parotid and submaxillary glands treated at the Mayo Clinic. The lesions were divided into mucoepidermoid tumors and mucoepidermoid carcinomas on the basis of histologic appearance. Twenty-nine mucoepidermoid tumors did not metastasize, seven mucoepidermoid carcinomas behaved like fairly high-grade carcinomas.

Marcial-Rojas and Sommers[521] regarded differentiated mucoepidermoid tumors as relatively benign neoplasms of the salivary duct in which the lining epithelium has undergone marked squamous and mucous metaplasia. A more malignant variety of mucoepidermoid tumor should be considered to be chiefly either an undifferentiated adenocarcinoma or adenoacanthoma originating in the salivary gland.

Bhaskar and Weinmann[522] found that the commonest site of origin of tumors of minor salivary glands was the palate and the commonest neoplasm was the mucoepidermoid tumor.

Berdal and Mylius[523] observed that cylindromas have a tendency to infiltration which far exceeds what they had previously

imagined. The cylindroma probably originates in the epithelium of the salivary ducts at the transition of the alveoli. There is good reason for retaining the term "cylindroma," which has been used for almost 100 years. The disease is far from uncommon. Particular stress should be laid on surgical treatment which should aim at primary radical removal. Inspection and palpation have not proved sufficient in guiding the surgeon with regard to the evaluation of the local extension. The results of operative treatment may be essentially improved by careful orientation during the operation with histological examination of tissue from the periphery of the operative field. The excision should be extended until tumor-free tissue is found everywhere in the marginal zone. The close collaboration between surgeon and pathologist during the operation offers these patients the greatest chance of permanent recovery.

Wawro and McAdams[524] presented a group of 18 cylindromas of major and minor salivary gland origin. The slow growth, high recurrence rate, delayed distant metastasis, and resistance to radiation therapy were noted as the characteristic pattern of behavior. Radical surgical removal was suggested as the primary procedure of choice.

Harrison,[525] too, emphasized that cylindromas present a serious problem in management. If the tumor is inadequately removed, there is a relentless local recurrence, and the mode of spread is similar to that of a rodent tumor with resultant severe and prolonged morbidity. When surgically inaccessible, the tumor may be irradiated; the response seemed satisfactory in an odd case in Harrison's series.

Ranger, Thackray, and Lucas[526] studied 80 mucous gland tumors of the head and neck derived from sites other than the major salivary glands; 41 were mixed tumors; 30 were basalomas (cylindromas); 6 were carcinomas; 3 were mucoepidermoid tumors. The findings clearly confirm the suspicion that the prognosis in tumors of the minor salivary and the mucous glands is worse than in those of the major salivary glands. One of the aims of this investigation was to see whether modern and improved radiotherapeutic techniques could permanently cure basalomatous growths (cylindromas). Unfortunately, tumors of this type treated by modern methods in the last year or two have already recurred. Nevertheless, radiation produced worthwhile palliation if surgical removal was out of the question.

Broadbent and Masters[527] studied 33 cases of salivary gland tumors of the head and neck exclusive of the major salivary glands. Thirteen were in the hard palate, six in the buccal mucosa, two in the alveolar ridges, four in the soft palate and lateral pharyngeal wall, five in the facial and neck skin, two in the lips, and one in the tongue.

According to Schulenburg,[528] there is increased frequency of mixed tumors in ectopic position in the South African Bantu.

Lambert[529] stated that mixed salivary tumors of the upper respiratory tract appear to occur more often in the female, and the hard and soft palate appear to be the commonest site for these tumors. To him tumors of this type arising in sites other than in true salivary glands are more likely to be malignant than those occuring in the salivary glands themselves. A critical study of 39 cases impressed Lambert forcibly that the degree of malignancy of an individual tumor is difficult to assess either clinically or histologically.

Putney and McStravog,[530] too, emphasized that the slow growth and clinical encapsulation of many of the aberrant tumors of salivary gland type make one overlook their potenialities. Most of these tumors possess the characteristics of low-grade malignant lesions.

Gavin[531] presented seven cases of mixed tumors of the palate, and Coyas[532] presented one case of mixed tumor of the upper lip.

The modern operation of conservative parotidectomy provides valuable material for

the pathological study of chronic "sialectatic" parotitis. Patey and Thackray [533] stated that the most striking histological changes are progressive accumulation of lymphoid tissue around the intralobular ducts with associated hyperplasia and metaplasia of the epithelium of the ducts and atrophy of the secreting tissue. Since sialography in chronic parotitis is associated so frequently with extravasation of iodized oil (Lipiodol), the possible advantages of sialography should be carefully weighed against the disadvantages.

Beyer and Blair [534] stated that the greatest value of sialography lies in differential diagnosis of mixed and malignant tumors, but deliberate sacrifice of the facial nerve is probably never justified from roentgen findings alone.

Ryan, Woolner, and Beahrs [535] stated that exfoliative cytology appears to be of little value as a routine preoperative test in cases of parotid tumor.

Lathrop's [536] article on diseases of the salivary gland is thorough and should be read by all interested people.

Irradiation of the submaxillary gland and obstruction of Wharton's duct produce fibrosis of the gland, which appears clinically as an indurated mass. Evans and Ackerman [537] stated that such masses may be confused with metastatic carcinoma. A careful appraisal of clinical and radiotherapeutic data in each case and the use of needle biopsy may aid in making the correct diagnosis and obviate unnecessary radical surgery.

Kelemen [538] examined 100 persons, all 71 years or older. Twenty-two showed bilateral enlargement of the submaxillary glands. It is imperative to know about this condition to avoid confusion with signs of malignancy.

Sickels [539] stated that local biopsy has no place in the diagnosis of parotid tumors except to confirm some of the more obvious malignant growths.

White and Garcelon [540] found that advanced tumors and cancers of salivary gland origin were favorably affected either by estrogen therapy alone or by the combination of hormone and nominal amounts of x-ray therapy. The results were most encouraging and were considered to warrant continued clinical investigation of this mode of therapy.

Tonsil

Noer [541] stated that carcinoma of the tonsil and oropharynx is a problem not yet solved. He favored irradiation of the primary lesion followed by radical dissection of the cervical nodes extending up to the irradiated area.

Dutta-Chaudhuri and Roy [542] discussed the pathological aspects of cancer of the tonsil based on a series of 152 cases.

Virtue [543] reported a series of 37 cases of cancer of the tonsil.

Carcinosarcoma is a tumor consisting of epidermoid carcinoma and sarcoma. Green [544] presented such a case under the name "collision" tumor of the tonsil.

Weaver [545] discussed the factors involved in the diagnosis and handling of patients with lymphoblastoma by the otolaryngologist.

Harman, Kodicek, and Pinniger [546] studied 16 cases of malignant lymphoma of the nose and throat. The patients were predominantly males in middle or old age. The tonsils were involved in nine cases, the maxilla in one, the nasopharynx in two, and the ethmoid in four. The behavior of malignant lymphomas in the nose and throat was similar to that of lymphomas presenting in other situations, and they showed the same tendency to become generalized. Reticulum-cell sarcoma was the commonest lesion in the series. No clear relation could be established between the histological picture and the clinical course.

Rainey's [547] patient with lymphosarcoma of the tonsil had survived almost 40 years since treatment.

Metson [548] stated that a single negative tonsillar biopsy should not be accepted as evidence definitely ruling out malignancy

as this is a fairly common misleading occurrence in lymphosarcoma of the tonsil.

Friedberg and Hass[549] presented the clinical and pathological data on 10 patients with lymphomas of the pharynx. There was often a lack of sharp differentiation in the histological classification of lymphomatous tumors. Microscopic features common to more than one type of malignant lymphoma were often evident in a given case.

Fostvedt and Fostvedt[550] and Edwards and Baker[551] each presented a single case of lymphosarcoma of the tonsil.

Jørgensen[552] presented a case of a pedunculated mixed tumor of the left tonsillar region of 20 years' duration in a 62-year-old man. Microscopic examination showed a mixed salivary tumor which had presumably undergone malignant degeneration. The tumor weighed 63 gm.

Baugh and O'Donoghue[553] reported on a teratoma of the tonsil in a newborn child.

Pharynx

Malignant Lesions.—Cade, Raven, and Reidy[554] discussed the surgical treatment of carcinoma of the pharynx. They stated that lesions of the pyriform fossa are silent for a long period; the postcricoid lesions give rise to dysphagia early, and the aryepiglottidean tumors give rise to abnormalities of sensation in the throat. They noted involvement of the lymph nodes in 50% of the epilaryngeal cancers, in 63% of the lateral pharyngeal cancers, in 73% of the cancers of the pyriform fossa, and in 50% of the postcricoid cancers. They mentioned two quotations from Trotter which illustrated why he went no further than lateral transthyroid pharyngotomy: one shows the material limitations of Trotter's times, and the second shows an attitude of mind. Both are of interest. "For the surgeon, the pharynx combines three of the most formidable obstacles to the exercise of his art: it is inaccessible in a high degree; it is a seat of delicate and concentrated function, and it contains septic material to which the surrounding tissues are in no way immune." It will be conceded that today sepsis can be controlled to a degree unknown to Trotter's generation, that most otolaryngologists consider the pharynx as easily accessible, and that its function, swallowing, can be provided for by surgical reconstruction. "I [Trotter] should not feel able to record as a true success the cure of a pharyngeal carcinoma won at the expense of laryngectomy." This second quotation illustrates Trotter's thoughts. Speaking for himself, Cade did not consider a laryngectomy too high a price for the patient to pay for a chance of escaping death from cancer of the pharynx. He was of the opinion that the skin-grafted plastic tube method of reconstructing the pharynx left much to be desired.

Tsukamoto and Tazaki[555] reported four cases of hypopharyngeal carcinoma occurring 20 years after irradiation for tuberculous lymphadenitis. The overlying skin showed remarkable signs of damage from the former irradiation. The clinical course of x-ray cancer of the hypopharynx is similar to the course of the common cancer of the same region.

Som and Peimer[556] also reported cases of radiation cancer of the postcricoid region. The malignant tumors appeared after protracted radiation with a 200-kv. machine: 17 years after treatment for intrinsic carcinoma of the larynx in one case, and 14 years after treatment for carcinoma of the epiglottis and false cord in another.

Raven and Levison[557] reported a case of cancer of the hypopharynx developing 23 years after radiotherapy for thyrotoxicosis. It had been calculated that the patient received 8000 r ±10%. Approximately 10 patients have had similar trouble according to other reports: 7 had radiotherapy for goiter; 3 for tuberculous adenitis. The average interval between radiotherapy and the development of pharyngeal cancer was 25 years.

Hutton[558] presented a series of 24 cases of Plummer-Vinson syndrome (dysphagia

associated with simple hypochromic anemia). Carcinoma of the postcricoid region developed in one woman, 39 years old, who had been observed for three years.

Lederman[559] suggested that the term "postcricoid cancer" be abandoned and replaced by the term "epioesophageal cancer," which is subdivided into: (1) cricopharyngeal cancer, including cancers of the mouth, the esophagus, and the so-called postcricoid region; (2) pharyngoesophageal cancer, when the tumor invades the upper part of the esophagus and lower part of the pharynx equally, and (3) cancer of the cervical portion of the esophagus. The methods of differentiating the tumors are discussed in detail. The incidence of five-year cure for 85 patients given radiotherapy was 9%.

Evaluation of the extent and operability of carcinoma of the hypopharynx, larynx, and cervical portion of the esophagus can be extremely difficult. The inoperability often does not become evident until operation and, beyond that, frequently only after the point of no return has been passed in the dissection. Grimes and Stephens[560] presented a series of 25 patients operated on for hypopharyngeal cancer, with four operative deaths. Analysis of their series indicated that the staged reconstruction of the swallowing tube is better than the one-stage procedure utilizing free-skin grafts.

Hamilton and Oppenheim[561] studied 61 patients with cancer of the hypopharynx and endolarynx. Eighty-one per cent of the patients with cancer of the hypopharynx, fifty-five per cent of those with endolaryngeal growths, and none of those with minimal endolaryngeal involvement had involved nodes. They favored operation if the cancer has fixed the cord and involves the subglottis or invades the endolarynx or hypopharynx.

Radiotherapy in cases of postcricoid carcinoma comes in for such a barrage of adverse criticism and condemnation that it seemed to be of value to Dingley[562] to report any cases, even though few in number, in which striking success has followed the adoption of such treatment. The one promising feature in the two cases presented was that involvement of the cervical nodes was not apparent clinically. Both patients were treated with a 10-gm. radium beam unit. One patient has remained alive and well for 6½ years and the other for 10¾ years. Each had well-differentiated squamous-cell carcinoma of the postcricoid region.

Lederman[563] outlined the boundaries of the pharyngolaryngeal groove and defined its relationship to the pyriform sinus. A method of classifying, staging, and differentiating tumors of the pyriform sinus was presented. A report is furnished on a personal series of 119 cases of cancer of the pyriform sinus seen at the Royal Cancer Hospital and the Royal National Throat, Nose and Ear Hospital, London. The five-year good result from radiotherapy was 6.5%.

Lederman[564] also stated in another paper that although one clearly cannot be satisfied with the poor results obtained, the fact remains that laryngopharyngeal tumors are extremely sinister in their behavior and natural history. Not only do the patients come at an advanced stage, but some constitutional or systemic factor seems to be concerned within the initial causation of these tumors and in the way in which recurrence takes place. A number of existing classifications of laryngopharyngeal cancers and cases of some 417 patients treated for the most part by teleradium were reviewed. The five-year survival rate was 13%. Unlike cancer of the larynx, where failures after radiotherapy can frequently be salvaged by operation, in the laryngopharynx such opportunities present themselves only rarely. There were in this series only 10 patients who had an operation on the pharynx after radiation therapy, and 2 of these patients had survived for some time after treatment: 1 for three years and 1 for five years.

Raven[565] told of the surgical experience derived from the treatment of 24 patients

with squamous carcinoma of the hypopharynx. The technical details of the operations were described together with the methods by which some of the difficulties can be overcome. Raven stated that in the treatment of carcinoma of the hypopharynx radical surgical procedures have an important place. For some patients radical removal is the only treatment which can be advised even though the disease has spread to the regional lymph nodes; for others such treatment can give help when radiotherapy has failed.

Leroux-Robert[566] gave the therapeutic indications for the different anatomical varieties of cancer of the larynx and hypopharynx. About 800 patients with cancer of the larynx and hypopharynx have been operated on during the past 18 years at the Curie Foundation. Of 684 surgical operations for cancers of the larynx and laryngopharynx performed before July, 1954, 145 for hypopharyngeal lesions have consisted of pharyngolaryngectomy, either with or without radical neck dissection, followed by systematic roentgen therapy. Of the 145 patients, 36 were treated for more than five years before. Ten had maintained recovery for the five years or more. This was contrasted with 35 recoveries among the 525 treated by roentgen rays alone.

Carroll and Shields'[567] experience with cancer of the laryngopharynx had been so distressing that it was apparent to them that radiation therapy left much to be desired. They noted that Baclesse reported in 1949 from the Curie Institute a five-year survival rate of only 6% for cancer of the hypopharynx. Metastasis to the cervical lymph nodes is one of the most important factors in the clinical course of cancers arising from the epilarynx and hypopharynx. They stated that since it has been proved that irradiation is unable to cure either the primary or secondary manifestations of these carcinomas, a more adequate surgical attack is logical.

Barbosa[568] described the surgical technique used in dealing with advanced cancer of the larynx and hypopharynx with bilateral metastatic lesions to the cervical nodes. In two years, 38 one-stage bilateral dissections of the nodes of the neck with one of the internal jugular veins saved were performed. The larynx was removed in 18 cases. Operative mortality was zero.

Hilger and associates[569] stated that the proper method of treatment for laryngeal, hypopharyngeal, and cervical esophageal carcinoma, with few exceptions, is surgical.

Missal's[570] concept of the surgical procedures for advanced carcinoma of the pharynx, larynx, and cervical portion of the esophagus was described with a historical review of the subject.

Horwitz and associates[571] stated that irradiation therapy of cancer of the hypopharynx has not proved successful. Surgical management should be given a much more extensive trial. They were encouraged by the early results of operation in these cases.

Fletcher, Old, and Luquvam[572] stated that tumors originating in the supraglottic region, epilaryngeal area, and pyriform sinus are treated by panlaryngectomy and heavy postoperative irradiation at the M. D. Anderson Hospital in Texas. The principles of roentgenological localization of the tumor and its extension were presented.

Synovial sarcomas are rare, highly specialized, histologically unique malignant neoplasms of mesothelial origin. Characteristically, their development is slow; they usually occur in the extremities of younger men, and they metastasize late by the lymphatic and hematogenous routes. Jernstrom[573] reported a case of synovial sarcoma of the pharynx.

Keim[574] presented two cases of epidermoid carcinoma of the vallecula. Anterior transverse pharyngotomy proved an effective way of handling these cases.

Reconstruction After Removal of Carcinoma.—After radical resection of the pharynx for cancer, Conley[575] strongly advised that if it is possible to reconstruct the mucosal defect in the pharynx by local

manipulation of the wound that should have priority over the use of a free-skin graft. The one-stage operation for immediate reconstruction of the pharynx and cervical esophagus has been carried out on 12 patients. Complications consist of infection, fistulas, stenosis, necrosis of tissue flaps, necrosis of esophagus and trachea, and pain.

Ashley, Briggs, and Affley[576] presented four methods of pharyngeal reconstruction. Of the four the primary closure technique utilizing available pharyngeal mucosa is the best. A skin graft has disadvantages in that it is dependent on the salvage of adequate covering from adjacent skin and subcutaneous tissue. Frequently, the postoperative complications of stricture is encountered. Multiple-stage procedures utilizing some form of flap give better functional results. A short review of the history of pharyngeal reconstruction was presented.

Sisson[577] presented 17 cases of cancer of the larynx, pharynx, and cervical esophagus treated by surgical means. Originally they had been enthusiastic about the advantages of immediate reconstruction of the cervical portion of the esophagus with the wire-mesh free-skin graft technique, but at the time of writing they considered formation of a pharyngostoma and esophagostoma a safer procedure.

Braund and Cocke[578] have tried various methods of reconstructing the cervical portion of the esophagus and have found the development of two pedicle grafts on the anterior chest to be the procedure of choice.

Hadfield[579] developed a technique which involves the use of both skin flaps and a Thiersch graft to reconstruct the pharynx. After removal of the pharynx and larynx the skin flaps (a vertical midline incision is used) are sewn down to the prevertebral fascia. The gap between the two flaps is then filled in by a Thiersch graft which is the floor of the pharyngeal gutter. The pharyngostoma is closed in four weeks by utilizing the neighboring skin of the neck. In every case except one, in which they used a free graft about a polyethylene tube, a stricture developed.

King[580] presented a method for the preparation of a posterior cervical flap which can be used to cover large neck defects which might occur after removal of intraoral, pharyngeal, and laryngeal carcinomas.

In Asherson's[581] case of pharyngectomy for hypopharyngeal carcinoma primary reconstruction of the pharynx was undertaken in a single-stage operation by use of the mucous lining of larynx and trachea. The growth was situated on the posterior pharyngeal wall.

Som[582] also described a case in which laryngoesophagectomy was performed and the anterior portion of the larynx and trachea was used as an autograft to form the anterior wall of the new laryngoesophagus. The posterior wall was formed with a free-skin graft wrapped around a Negus-type latex rubber mold.

Wilkins[583] presented a method of preserving the mucosal lining of the larynx and using it for anastomosis to the esophagus to bridge the defect created by excising certain carcinomas of the extrinsic larynx and cervical portion of the esophagus.

Goligher and Robin[584] described a case in which antethoracic esophagopharyngoplasty using the left part of the colon successfully restored continuity with the stomach after pharyngectomy for carcinoma of the pharynx. A two-stage technique was advocated for freeing of the colon.

Jack[585] accomplished reconstruction of the pharynx by anastomosing the lower half of the divided esophagus to the pharynx. The blood supply of the lower half of the divided esophagus can be adequately maintained from the right gastric and right gastroepiploic vessels via the stomach.

Erdgélyi[586] noted that closure of large stomas and those in which the surrounding tissues have been affected by x-ray therapy demands transplantation of tubular flaps.

Lam and Gordon[587] and Hardin[588] presented methods of reconstructing the cervical portion of the esophagus.

Miscellaneous.—Acanthosis nigricans is a benign cutaneous manifestation that occurs concomitantly with certain forms of systemic or internal cancer. In 50% of the cases of acanthosis the condition is found in association with a cancer of one of the internal organs. This is the so-called malignant type. In both malignant and benign varieties, the cutaneous lesions per se never evidence malignant changes. The cutaneous lesions resemble the cutaneous picture of Addison's disease with the addition of papillomatous and verrucous proliferation. Most observers have reported a preponderance of adenomatous type of neoplasia, and the majority of all malignant tumors associated with acanthosis nigricans occur in the abdomen. Miller and Davis[589] presented a patient with a primary squamous carcinoma of the hypopharynx and metastasis accompanied by acanthosis nigricans of the skin.

Radioactive iodine tracer studies provide a highly satisfactory method of diagnosing lingual thyroid. The advisability of subtotal excision or possible autotransplantation of the tissue is strongly questioned by Ward, Cantrell, and Allan.[590] Treatment with radioactive iodine seems for the present to be ill-advised. Complete excision, followed by appropriate thyroid replacement therapy, was recommended as the treatment of choice. Lateral pharyngotomy provides the most satisfactory surgical approach.

Einhorn and Larsson[591] presented a case of a large lingual goiter which appeared eight years after surgical removal of a nodular, partly intrathoracic goiter. An exact diagnosis was possible with the aid of I^{131}. This is the first case reported in which I^{131} brought about complete macroscopic disappearance of the lingual goiter. Treatment with radioiodine cannot be recommended for more general use in cases of lingual goiters, however. Special indications existed in this case for its use.

Springer[592] reviewed the literature on lingual thyroid. He presented two cases of lingual thyroid in siblings, which he considered the first such cases to be reported. The use of radioactive iodine for diagnosis and therapeutic iodine for diagnostic and therapeutic purposes was discussed.

Hendrick[593] reported five cases of lingual and intralingual goiter. Treatment consisted of excision of the tumors through the intraoral route in two cases and removed through a median pharyngotomy in three.

Exclusive of the central nervous system, 37% of neurilemmomas occur in the head and neck. Gore, Rankow, and Hanford[594] stated that an external lateral cervical approach provides adequate and safe access to the parapharyngeal neurilemmomas.

Cases of neurofibromas of the pharynx were presented by Manning,[595] Stewart,[596] Ranta,[597] Marcial-Rojas and Picó,[598] Marshall and Bradford,[599] and Arneaud.[600]

Both cranial and cervical chordomas may give rise to symptoms from the throat and cause diagnostic difficulties. Cranial and cervical chordomas may be visible in the epipharynx, mesopharynx, or hypopharynx or on the side of the neck. Laage-Hellman[601] presented the clinical, roentgenological, and histological description of a case of chordoma arising at the site of congenital fusion of the cervical vertebrae.

Orton[602] stated that the best procedure for the cervical chordoma that projects into the pharynx is lateral pharyngotomy. Irrespective of what type of operation is performed, the body of the cervical vertebra is involved from the beginning.

Morfit[603] reported 12 cases of patients with retromandibular parotid tumors presenting as pharyngeal tumors. An external surgical approach was recommended.

Havens and Butler[604] presented the experience of the Mayo Clinic with 41 cases of mixed tumor of the pharyngeal wall seen

in 37 years. The transoral approach was used in 37, and the external approach in 4.

Beales [605] reported finding a mixed tumor of the pharynx suggestive of a peritonsillar abscess.

Abercromby and Rewell [606] reported the case of a mixed tumor of the pharynx and larynx arising in the region of the false cord. It was removed through a midline incision after preliminary tracheotomy.

Wilkerson [607] reported a mixed tumor of the pharynx and parotid gland.

Laycock [608] reported a large hypopharyngeal polyp which proved to be a lipoma. It was removed through an external incision in the neck. There was a picture of the patient with the tumor projecting from the mouth.

Kay [609] reported the case of a 35-year-old man who died of asphyxia caused by a cyst in the vallecula.

Howell and Prince [610] reported the case of a 15-week-old infant who was found to have a cyst on the base of the tongue. These lesions are rare but should be considered as a possible cause of respiratory difficulties or feeding problems in infants.

Cardwell, Bernhard, and Aquino [611] reviewed the literature and reported a case of amyloidosis of the base of the tongue.

Ausband and associates [612] reported a case of myxolipoma of the base of the tongue.

Epstein and Loeb [613] reported a case of pedunculated thymic tumor of the hypopharynx in a 3-week-old infant.

Johnson and Strong [614] described a benign teratoma of the extrinsic larynx in a 50-year-old man.

LeJeune and associates [615-617] reviewed the available literature on the pharynx and pharyngeal surgery for 1952, 1953, and 1954.

Diverticula.—Kaufman [618] stated that, although lateral pharyngeal diverticula are rare, they should be considered in the differential diagnosis of dysphagia, especially in those cases in which the symptoms are of long duration.

Jackson and Norris [619] presented a series of 75 cases of diverticulum of the hypopharynx, in 53 of which operation was done during the past 10 years. They stated that their experience reconfirmed the value of the one-stage, esophagoscopically guided operation.

Mortensen and associates [620] reviewed a series of 339 one-stage diverticulectomies performed in a period of 10 years at the Mayo Clinic.

Sweet [621] stated that esophagoscopic examination of patients with a diverticulum of the esophagus at any level is not only unnecessary in the usual case but also inherently dangerous. It should be avoided whenever possible. A one-stage operation for removal of a diverticulum of the pharyngoesophageal junction is recommended. The adaptation of this technique to the removal of the diverticula of the lower segment of the esophagus is highly satisfactory.

Harris [622] stated that there is no justification for the two-stage repair of pharyngoesophageal diverticula today. Harrison [623] discussed the treatment of pharyngeal diverticula. It was his opinion that removal of the sac is often associated with complications and is seldom essential. In the early stages, dilatation of the esophageal opening may relieve the symptoms, but later external division of the cricopharyngeal muscle fibers, together with inversion of the sac, should be considered. When the sac is large or extends behind the sternum, endoscopic division of the party walls of esophagus and sac is the treatment of choice. This method was described in detail.

State and Katz [624] recommended a lateral decubitus position rather than the usual supine position with the head turned to the side for operations on the cervicoesophageal diverticulum.

Johnston [625] reported a case of pulsion diverticula of the hypopharynx and advocated that otolaryngologists interested in surgery of the neck should do the operation.

Gammelgaard [626] reported that from 1946 to 1954, 31 patients with esophageal diverticula were treated in Righospitalet. A follow-up study of 18 of these patients demonstrated clinical cure in 16 but roentgenological evidence of recurrence in 14.

Kiehl and Mitchener [627] reported a case of diverticulum of the esophagus following trauma.

Riberi, Battersby, and Vellios [628] presented a case of carcinoma arising in a pharyngoesophageal diverticulum.

Larynx

Influence of Smoking.—Wynder, Bross, and Day [629] stated that data in 209 cases of laryngeal cancer in the United States, in 138 cases in India, and in additional cases in Sweden showed that this condition was but rarely seen among men who were nonsmokers or light smokers. Heavy consumption of whiskey increased the risk for intrinsic and particularly extrinsic laryngeal cancer, but no increased risk was found for those consuming beer or wine predominantly. The results presented show that the risk of development of cancer of the larynx increases with an increase in alcohol consumption as well as with an increase in tobacco consumption. The Swedish data on extrinsic cancer of the larynx in women showed a relation to dietary deficiencies, which could not be demonstrated in American data.

Ryan, McDonald, and Devine [630] compared microscopic sections from the larynx of nonsmokers with sections from the larynx of known excessive smokers. The surface epithelium was thicker in smokers than in nonsmokers; this was due in part to excess keratinization of the true cord but mostly to epithelial hyperplasia of the false cord, the true cord, and the subglottic area.

Malignant Lesions.—Curran [631] presented a picture of laryngeal carcinoma in Connecticut, including a brief résumé of the history of laryngeal carcinoma. He took issue with those who consider that the laryngologist should confine himself to keyhole surgery, using his skill in endoscopy only to determine what type of operation the general surgeon should perform.

Lancaster [632] stated that in Australia the death rate for cancer of the larynx among males had declined before 1945 and this decline has continued.

Fatin [633] noted that almost all of the cases of carcinoma of the larynx in Egypt are seen by the specialist so late that nothing short of total laryngectomy can be done.

The mortality [634,635] from laryngeal cancer has remained practically constant in Britain for the last 40 years, according to Curwen and associates.[634] At the same time both the mortality rate from bronchial cancer and the consumption of cigarettes have increased rapidly, according to an editorial in the British Medical Journal.[635]

Furstenberg [636] stated that a symposium on carcinoma of the larynx promises to raise many controversial issues. Any attempt to describe the behavior of cancer and establish criteria for the diagnosis and treatment of this complex and vagarious disease is destined to provoke ethical differences of opinion. He cautioned the surgeon not to hasten to perform major operations on the larynx for obscure lesions whose diagnosis is highly questionable from what is in the case record and can be seen in the larynx. He stated that there must be no apprehension about taking a little time for clinical studies and deliberations. Although the surgeon must not err on the side of conservatism, Furstenberg was convinced that often too little attention is given to the clinical behavior of laryngeal disease and too much value is placed on the pathological diagnosis of the lesion.

Figi [637] emphasized that a report of inflammatory tissue returned on a specimen from a lesion that looks malignant clinically demands that further histological study be carried out.

Because of the complex nature of carcinomas, there can be no routine operation for cancer of the larynx. There is a vast

difference in the types of laryngofissure and in the types of laryngectomy. Farrior, Bagby, and Iglesias[638] stated that in extensive lesions it does not matter who performs the biopsy, but in borderline lesions, the laryngeal surgeon should have the privilege of examining the larynx before biopsy.

McCoy[639] discussed atypical laryngeal lesions and stated that it is always a good policy to insist on one's own biopsy, or at least the opportunity to review the pathological sections of tissue removed elsewhere. Refusal to accept a written report should not be interpreted as being distrustful or discourteous.

Aprigliano and Torres[640] advised the use of frozen-section method for pathological diagnosis during endoscopic examinations. They considered this method to be absolutely reliable.

Laryngeal cytology may have particular advantages in diagnosis. Whitaker and Siegler[641] stated that it could be used as a serial test with which to follow conditions that are suspected of being malignant or biopsy-proved lesions which have been treated by irradiation alone.

Ayre[642] studied throats of 142 persons cytologically. Sixteen showed malignant cell brushings and nine were classified as "suspicious." Histological follow-up in 14 cases confirmed the diagnosis in 10 of the cases with positive cytological findings and in 2 of the suspect cases. In one case false negative diagnosis had been made on cytological study.

LeJeune[643] emphasized the advantages of suspension laryngoscopy in the performance of any type of intralaryngeal surgery. Suspension laryngoscopy facilitates removal of benign and early malignant tumors of the larynx.

Less than 6% of carcinomas of the vocal cords will be found to satisfy the rigid requirements necessary to qualify for transoral extirpation. The growth must be in the early stages of development, small in size, limited to one vocal cord and completely surrounded by normal tissue. LeJeune[644] stated that the advantages of transoral extirpation are (1) simplicity of the technical procedure; (2) absence of an external incision; (3) preservation of continuity of the thyroid cartilage; (4) good postoperative phonation; (5) shorter hospitalization, and (6) good prognosis. Suspension laryngoscopy permits an adequate approach and good visualization of the larynx so that transoral extirpation of a cordal growth can be satisfactorily accomplished.

The main problem of laryngeal cancer is still one of early diagnosis. Leak[645] stated that reports indicate that curability rates are higher after operation than after irradiation in advanced lesions. At present, operation appears to be the treatment of choice in cancer of the larynx and in its extended form in producing a high salvage rate.

The *Cancer Bulletin* (of Texas)[646] pointed out that when indirect laryngoscopy is properly used the physician can detect most laryngeal cancers.

Laminography is an additional method of examination that will aid the laryngologist in the care of the patient with lesions of the larynx. Schall, MacMillan, and St. Aubin[647] indicated that laminography as applied to the study of the larynx should be credited to Felix E. Leborgne of Montevideo (July, 1936).

Laminography for laryngeal diagnosis has not become a routine procedure with laryngologists. It meets with certain objections: in the first place, the larynx being accessible to other adequate means of investigation, roentgenology is superfluous; in the second place, it gives unreliable information. LeBorgne[648] stated that there are regions of the larynx which are difficult to see on laryngoscopy, such as the subglottis. Tomography has shown great superiority over earlier methods of roentgen diagnosis of carcinoma of the larynx. Tomograms taken during phonation are the most satisfactory. Every patient should have a tomogram, lateral roentgenogram, and laryngoscopy.

Lesions that arise submucosally and continue to grow submucosally within the substance of the false vocal cord present difficulties in diagnosis. Tomography can be considered only as an aid in diagnosis. Work[649] found that deep submucosal biopsy and needle biopsy of the false vocal cords have been unsatisfactory. Absolute diagnosis has been made by thyrotomy excision of tissue under direct vision, and microscopic examination of frozen sections. In about 3% of all cases of cancer of the larynx the lesion is primary on the false vocal cord. These patients should be treated with wide-field laryngectomy and block dissection of the neck whether or not nodes are palpable in the neck.

Putney[650] stated that certain laryngeal lesions, of which the principal ones are keratosis, carcinoma in situ, the salivary gland type of tumors, and papilloma, are borderline malignant lesions, because at times they are relatively benign and at other times frankly malignant. The problem of management is paramount. It can be simplified to some extent if any lesion in this category is considered premalignant and care is taken to ascertain just how benign or malignant each individual lesion is. The determination must be based on both histological structure and clinical evaluation.

Keratosis implies a whitish patch, either flat or raised, smooth or nodular, localized or diffuse, surrounded by normal or by inflammatory tissue. The histological findings consist of incomplete desquamation and abnormal cornification of the epithelial layer of mucosa with the formation of excessive keratin on its surface. The cause generally has been attributed to chronic irritation of long duration. Putney and O'Keefe[651] reported on a series of cases which they divided into three groups: (1) those in which carcinoma was present when the patients were first seen (57 cases); (2) those in which lesions were first benign and later developed into carcinoma (27 cases), and (3) those in which there never was any evidence of malignant degeneration (41 cases). Their discussion was concerned with the second group of 27 patients with keratosis progressing to carcinoma. Repeated histological examination of different portions of the keratotic lesion may be needed to make an accurate diagnosis. The management depends on the clinician's evaluation of the lesion. He cannot accept a negative pathological report as unequivocal and advise treatment solely on the basis of this finding. The clinical appearance of the lesion and the laryngologist's judgment are equally potent factors in determining the type of treatment.

Davis[652] stated that there is no keratinization of the epithelium in the healthy larynx which is lined with stratified squamous epithelium on the anterior surface of the epiglottis, on the upper part of the posterior surface of the epiglottis, on the aryepiglottic folds and over the vocal cords. Keratinization can occur as a result of irritation. It can occur in those parts of the larynx normally lined with ciliated columnar epithelium only after metaplasia with squamous epithelium has taken place.

Black[653] expressed the opinion that hyperkeratosis is a change which occurs in squamous epithelium of a physiological or pathological nature, commonly as a response to some irritant. Whereas in the larynx, the epithelium is normally moist, this change produces the appearance of white plaques, and the resultant clinical picture is called "leukoplakia." The rather generic term "keratoses" is useful but tends to confusion now, as it should be limited in meaning to keratosis pharyngis, a condition of different nature and different outlook. Accordingly as far as the larynx is concerned, it seems wise to avoid the term. The same exclusion must apply to the term "pachydermia," which tends to be accepted as referring to limited thickening of the epithelium in the interarytenoid region.

Friedberg and Wallner[654] stated that leukoplakia was evident in 61% of their patients with cordal cancer. Inasmuch as leukoplakia figures prominently as a pre-

cursor of cordal carcinoma and is seen most often in heavy smokers, excessive smoking may be regarded as a predisposing factor.

Cracovaner and Rubenstein[655] stated that keratosis of the larynx is often impossible to cure by endolaryngeal methods. Laryngofissure is an ideal method of management, and it should be used more frequently and probably earlier than has been the custom formerly.

Bond[656] stated that the most suitable cases for radiotherapy are those in which the leukoplakia is confined to the cords. Radiation should not be employed if leukoplakia is diffuse.

Miller and Fisher[657] stated that no conclusions can be drawn concerning the ideal treatment of carcinoma in situ of the larynx. The combination of stripping with radiation has been elected most frequently. They reported their experience in 13 cases. Conservative surgical treatment controlled the lesions of the three in which it was used. Radiation alone controlled the lesions in the three in which it was used. Radiation and stripping provided control in five of the seven cases in which they were used.

Scharfe, Tanton, and Mathews[658] reported four cases of carcinoma in situ of the larynx.

Patients with laryngeal carcinomas treated by irradiation or surgical procedures should be observed closely for possible development of bronchogenic carcinomas. Thomson and Schaff[659] stated that carcinomas of the larynx and bronchus in the same individual should be regarded as separate primary tumors and treated as such. The problem of the management of carcinoma of the larynx with simultaneous or subsequent development of bronchial carcinoma prompted their study of 6 such cases encountered at necropsy among 20 cases of laryngeal carcinoma.

It is difficult to establish a correct classification of carcinoma of the larynx. LeBorgne[660] presented a definition of the larynx and a simple method of classification and staging of cancer of the larynx. Attempts at classification have been made ever since the beginning of the laryngoscopic era.

LeJeune,[661] Hall,[662] and Soboroff[663] presented their opinions regarding the diagnosis and treatment of tumors and cancers of the larynx.

Lesions suitable for laryngofissure are those limited to the cordal level and those with free mobility. Jackson[664] stated that the surest way to throw any procedure into disrepute is to use it in "unsuitable" cases. Jackson obtained good end-results in 87.2% of the 181 cases of proved cancer of the larynx seen in a 17-year period and treated by thyrotomy.

Lynch[665] stated that the indications for laryngofissure have broadened. Naturally the incidence of recurrence is greater. However, in view of the fact that 73% of LeJeune and Lynch's[666] patients have not had a recurrence, this means that many more patients have been spared loss of their voice and laryngeal airway. Laryngofissure operation was performed on 203 of 674 patients with carcinoma of the larynx encountered by them (Lynch and LeJeune). Recurrences developed in 15.2% of these 203. Of the patients with recurrences 44% were salvaged by laryngectomy. In their experience the laryngofissure operation was indicated in approximately 30% of patients with laryngeal carcinoma.

Opheim[667] reported four cases of benign tumors of the larynx presenting as submucous tumors. He recommended removal by a modified laryngofissure method without entering the respiratory tract.

During the past five and one-half years, Figi[668] has performed hemilaryngectomy with immediate grafting of skin in 28 cases of moderately advanced carcinoma of the larynx with one recurrence. He pointed out that the procedure has only limited application. During the same period (five and one-half years) 293 thyrotomies and 276 total laryngectomies were performed on his service.

Pressman[669] described an operation that might be termed "radical conservative" (laryngoplasty to avoid laryngectomy) for cancer of the larynx.

Martin[670] noted that in the United States during a five-year period, 1947 to 1952, the number of total laryngectomies increased from 846 in 1947 to 1315 in 1952. The over-all increase in the incidence of total laryngectomy for the five-year period was about 55%. The over-all proportion of total to partial laryngectomies was approximately 2:1.

Ogura[671] stated that there should be no choice as to the method of laryngectomy. Only a "wide-field" laryngectomy insures an adequate margin of safety. It is most essential that elective dissection of the nodes of the neck be performed for all advanced laryngeal carcinoma. Any laryngeal carcinoma that extends off the true cord or arises from any area other than the true cord, with or without cervical metastasis is considered advanced.

Hoover[672] agreed that when laryngectomy is to be done a "wide-field" resection should be practiced, as there is less chance of leaving cancerous tissue and the patient's ultimate disability is no greater than with the "narrow-field" operation.

Work[673] pointed out that experience has shown that the low-collar incision can be used successfully for "wide-field" laryngectomy. Advantages with its use both to the patient and laryngeal surgeon far outweigh its disadvantages.

Schall[674] used the Gluck-Sorensen U incision for total laryngectomy. The removed specimen should include the body of the hyoid bone with the attached sternohyoid and the anterior belly of the omohyoid muscles, the epiglottis, the preepiglottic space, the entire larynx, and perhaps one or more tracheal rings. Of 165 patients with cancer of the larynx treated by laryngectomy between the years 1931 and 1948, 60.6% lived five years or longer without recurrence.

Pollack[675] studied 18 patients with extrinsic laryngeal cancer. In 15, cervical lymph nodes were involved during the course of the disease. Pollack used a combined operation in which wide laryngectomy was incorporated in a radical neck dissection. This operation was suggested for all patients with laryngeal cancer in whom metastatic lesions in cervical lymph nodes are likely to occur.

Poweleit and Kratz[676] reported their experience with 10 patients on whom they have performed laryngectomy and neck dissection since 1952.

Kaplan[677] suggested the term "extended laryngectomy" to indicate a procedure which not only includes the larynx but the region of tumor growth. This may be the vallecula, base of the tongue, hypopharynx, postcricoid space, upper part of the esophagus, or trachea.

Laryngectomy alone for extensive laryngeal lesions without palpable lymph nodes has failed in 30% of the cases, according to Orton.[678] Serious attention must be directed to these cases. Orton stated that the combined operation is indicated for the following conditions: (1) subglottic carcinoma, involvement of the aryepiglottic fold, and pyriform sinus; (2) carcinoma of the ventricle with involvement of the epiglottis; (3) massive epiglottic lesions, and (4) involvement of the lateral wall of the pharynx. The operation is not indicated for true cord tumors, and surgical procedures are contraindicated when lymph nodes are large and fixed.

Bocca[679] stated that a careful histological investigation of the cervical lymph nodes in about 500 patients with cancer of the larynx operated on at the otolaryngological clinic of Milan by therapeutic or prophylactic neck dissection revealed metastasis in 73% of those with marginal, 50% of those with vestibular, and 30% of those with ventricular cancer; in 0.4% of those with cancer of the vocal cords; in 46% of those with supraglottic cancer; in 76% of those with cancer of the hypopharynx, and in

TABLE 2.—*Five-Year Cures After Surgical Treatment of Laryngeal Cancer*

Five-Year Cures, %	Procedure	Clinical Impression
25	Laryngectomy or pharyngolaryngectomy, radical dissection of the neck, and postoperative irradiation (7000–8000 r)	Nodes clinically positive
33	Laryngectomy or pharyngolaryngectomy and postoperative irradiation	Nodes clinically negative
65	Laryngectomy or pharyngolaryngectomy, radical dissection of the neck, and postoperative irradiation	Nodes clinically negative

90% of those with diffuse cancer of the larynx. Statistics from the clinic show the five-year cures in surgically treated cancer of the larynx (Table 2).

Bocca quoted another authority (Pietrotoni) who maintained that each time the cancer is situated outside of the vocal cords, regional surgery should be employed. In all cases in which the situation of the cancer is such as to make bilateral invasion of the lymph nodes probable, prophylactic dissection of the neck should extend to both sides as a two-stage procedure. In the last five years 112 bilateral two-stage neck dissections have been performed at Bocca's clinic with an interval of three to four weeks between stages. No fatalities occurred. Bocca expressed the view that prophylactic dissection of the neck permits preservation of the spinal accessory nerve.

O'Keefe[680] stated that, although laryngectomy is technically an adequate surgical procedure, the relatively high incidence of postoperative metastasis (20% to 30%) indicates its actual inadequacy. One-stage laryngectomy and radical dissection of the neck are indicated when cervical nodes are palpable at the time of initial operation, and relatively indicated when cervical metastasis is suspected or anticipated. Lesions of subglottic or supraglottic origin and cordal lesions with subglottic extension or arytenoid fixation are ideally suited to this elective surgical method.

It appears that total laryngectomy and elective block dissection of the neck should be the surgical procedure of choice in a greater number of cases than heretofore. Clerf[681] emphasized that this operation should be employed for all supraglottic and infraglottic lesions unless they are of recent origin and small. While early cordal lesions usually do not metastasize, every patient with fixation of an arytenoid or with suggestive subglottic extension should be considered a candidate for total laryngectomy and elective block dissection.

Ogura[682] presented a pathological study of 59 surgical specimens removed by laryngectomy and elective or therapeutic radical neck dissection for carcinoma of the larynx. A high incidence of metastasis from extrinsic, subglottic, and endolaryngeal carcinomas was demonstrated in impalpable nodes: 57%, 50%, and 31%, respectively. Only "wide-field" laryngectomy would remove the local laryngeal lesion. The thyroid on the side of the lesion should be removed. The incidence of metastatic lesions from endolaryngeal, subglottic, and extrinsic cancers in impalpable nodes is sufficiently high to justify en bloc elective unilateral or bilateral neck dissection with laryngectomy.

O'Keefe[683] presented 71 cases of secondary radical neck dissections for cancer of the larynx. In 11 cases the primary operation was thyrotomy; 63.6% of these patients were alive and well five years later. In 60 patients the primary operation had been laryngectomy; 40% of these patients were alive and well five years or more after a secondary radical neck dissection. In nine patients the primary operation had been laryngectomy and radical dissection of the neck; 33% of these were alive and well five years or more after a secondary radical dissection on the opposite side of the neck.

Reed[684] presented the statistical results in 75 cases of dissections of the neck done for primary carcinoma of the larynx at the Massachusetts Eye and Ear Infirmary. If metastatically involved nodes were 2 cm. or less in size, the two-year survival rate was 87%; whereas, if the metastically involved nodes were more than 2 cm. in size,

the two-year survival rate was 7%. If the primary lesion was limited to one side, 84% of the patients had metastasis to the same side, 10% to the opposite side, and 3% to both sides.

Mattick and Mancini[685] noted that intrinsic cancer of the larynx constituted 40% of all laryngeal cancer seen at Roswell Park Memorial Institute in the years 1942 through 1947. Of the patients with proved cancer without involvement of the nodes of the neck, 36% were free of the disease five years or more after surgical or radiological therapy. Of those with involved nodes, only 4.5% were free of disease for five years. Surgical treatment cured for five years or more 71% of the patients on whom it was performed, that is, laryngofissure cured 83% and laryngectomy 62%. Radiation cured 18.7% of a less highly selected group. In a more prospective group, for whom tracheotomy was not required, radiation cured 25%. Figures for three-year cures showed a relatively higher percentage, and when compared with the five-year results indicated definitely that additional mortality as high as 10% may be expected during the fourth and fifth year after therapy.

McCall and Fisher[686] performed 149 laryngectomies in 15 years. The over-all five-year survival rate for laryngectomized patients was 52%. In extrinsic carcinoma the five-year survival rate was 21%.

Hoover and King[687] reviewed the management of the patient with obstructive laryngeal cancer. In the two illustrative cases presented, immediate, definitive treatment was given for laryngeal carcinoma which caused obstruction of the airway. They stated that airway obstruction secondary to cancer is an emergency and that the relief of obstruction in selected cases should be incorporated with laryngectomy.

Cracovaner and Rubenstein[688] presented a case of dilatation of the pharyngoesophagus following total laryngectomy. This was repaired by placing fascia lata strips across the front of the neck.

Guggenheim[689] reported a case of cancer of the pyriform sinus and reviewed the recent literature and discussed the present trends of treatment.

Willems[690] described the lining of a cervical skin flap with a Thiersch graft prior to total laryngectomy.

Putney[691] used continuous suction drainage after laryngectomy and radical neck dissection in 36 cases. Results seem to be better, less fistulas and shorter hospital stay.

Infection, stitch dehiscence and poor tissue bed are the principal etiological factors in causing pharyngeal fistula. Conley[692] stated that the vast majority of uncomplicated fistulas heal spontaneously.

Connelly[693] presented a case of post-radiated carcinoma of the epiglottis in which the pharynx, upper part of the esophagus, and neck tissues sloughed after wide-field laryngectomy.

Rehabilitation after the Laryngectomy.—Waldrop[694] stated that rehabilitation of the laryngectomized patient presents three distinct problems for both the patient and his family: (1) the education and preparation prior to operation; (2) the adjustment to the hospital procedure, and (3) the post-surgical readjustment. "An attempt is made to teach the trapping of air in the pharynx just below the cricopharyngeus area, or pseudoglottis, by a forced lingual-velo-pharyngeal closure accompanied by the contraction of the constrictor pharynges muscle." The education and preparation for laryngectomy must be handled individually. No set procedure will always be effective and problems will arise which require the close cooperation of all concerned for their solution.

Equen,[695] too, discussed the question of rehabilitation after laryngectomy.

Several methods are employed in teaching esophageal speech. A few teachers claim superiority of one over another, but the majority of teachers adapt the procedures to the patient. Moore[696] stated that those who are most adamant about the best method are apt to be those laryngectomees who hold

the opinion that the method which worked for them is the one everyone should use. The two basic procedures for taking in air are injection and inhalation. It has been found that the role of learning and the excellence of the results obtained are not directly related to the type of operation performed.

Rickenberg [697] was of the opinion that a speech pathologist who is trained in phonetics and physiology should reeducate the laryngectomized person. The use of carbonated water or sodium bicarbonate is a hindrance. Rehabilitative programs should start with preoperative consultation in which the patient is informed as to the effect of the operation on verbal communications.

Jesberg [698] on the other hand has concluded that preoperative training has not been useful or practical inasmuch as esophageal speech seems easier after the larynx is removed. Moreover, even if the patient could not learn preoperatively, operation still would have to be carried out.

Approximately a third of all patients do not learn to speak. From observation of some patients who consider themselves able esophageal speakers, the proficiency of the remaining two-thirds was questioned by Lueders.[699] Most patients are able to produce intelligible speech with the electrolarynx after practice of a few minutes to a few hours.

Hyman [700] conducted an experiment to compare selected aspects of esophageal speech, speech with an artificial larynx, and normal speech. Twenty-four persons participated as experimental subjects in the investigation. This study indicated that speech production by means of the artificial larynx (reed type) was always acoustically preferable to esophageal speech. There is no significant difference in intelligibility. Further research is needed on the visual aspects of these two types of speech to determine whether listeners object to seeing the artificial larynx and how detrimental it is to the effectiveness of the speaker.

Heaver, White, and Goldstein [701] reported the experience of the National Hospital for Speech Disorders with 274 patients admitted in a two-year period, 1952 to 1954, for training in esophageal voice. Fifty-four per cent of the patients had lost their jobs because they could not talk. Forty per cent of the 274 discontinued treatment against advice. Although a third of this group had to cease their attendance because of such factors as the need for additional operation, medical or serious emotional complications, travel distance, or demise; the remaining two-thirds apparently left the clinic because of overwhelming feelings of futility regarding the possibility of ever speaking as adequately as they once did; 88% of all the patients, however, demonstrated a capacity to acquire esophageal voice.

Levin [702] described the patient who has undergone laryngectomy and his problems. In addition to the training facilities now available, there is need for more active teaching programs both for patients and teachers in well-located areas.

Robe and associates [703] studied the role of certain factors in the development of speech after laryngectomy. Analysis of 32 laryngectomized patients indicated that the type of operation did not in itself appear to determine the relative excellence of the speech attained later or the amount of speech training necessary to achieve satisfactory postlaryngectomy speech. Preservation of the strap muscles was not considered too significant. No conclusions could be drawn in regard to the role the cricopharyngeus plays in the postoperative speech development. The type of operation was not considered significant. It appeared that two factors are present in good speakers: (1) a well-defined controllable constriction zone in the region of the cricopharyngeus which will act as a pseudoglottis, and (2) an adequate-sized air column below the pseudoglottis. The presence or absence of the hyoid bone does not seem to be related to quality of voice. Results of the study showed that laryngec-

tomized patients who have mastered esophageal voice have positive synchrony between pulmonary and phonic respiration. Records of esophageal speech show that the subject breathes just as in normal speech.

Hoople and Brewer [704] stated that the cricopharyngeal sphincter represents the primary source of sound vibration for voice production in laryngectomized patients.

Tato and associates [705] made a study of laryngectomized patients using the Sona-Graph. This instrument records on a special sheet of paper with the time factor on one axis and "on the other the component frequencies in a complex pattern of sounds of a duration of 2.8 seconds, analyzing the harmonics between 85 and 8000 cycles."

Dornhorst and Negus [706] reported on a patient who mastered esophageal speech after removal of the larynx and upper part of the esophagus for postcricoid carcinoma. The pharynx had been reconstructed with a free-skin graft.

Olfaction after Laryngectomy.—With a view to throwing further light on the mechanism of hematogenic olfaction, Marco, Morera and Gimenez [707] studied olfaction via nasal and hematic approaches in a group of 44 laryngectomized subjects. The results obtained suggest that hematic stimulation of the first cranial nerve is associated with direct stimulation of the olfactory centers.

Irradiation in Management of Malignant Lesions.—Ormerod [708] presented the Semon Lecture in 1953 in honor of Sir Felix Semon who enunciated Semon's law. In this lecture he set forth what can be done for a person suffering from cancer of the larynx and the changes that have taken place in recent years in the opportunities and responsibilities associated. This is a good lecture by an expert in the field. Ormerod stated that in the past radiotherapy had been applied when cancer was too far advanced for surgery, but now early lesions are treated by irradiation, and operation is reserved for those which are unsuitable for radiotherapy.

A new generation of surgically well-trained laryngologists has become naturally fond of what they have learned to practice and naturally contemptuous of radiotherapy, which is often limited to the advanced lesion or recurrence or which is entrusted to one who is uninterested or unskilled in radiotherapy. Del Regato [709] stated that the results of radiotherapy for carcinoma of the laryngeal vestibule compete favorably with those of total laryngectomy for the same group of tumors. Radiotherapy achieves its more constant and best results on early noninfiltrating carcinomas of the vocal cord. The results of radiotherapy for carcinoma of the retrocricoid and subglottic regions and infiltrating carcinomas of the cord do not justify its choice as a primary form of treatment. Surgical treatment is also preferable if practicable, in the presence of metastasis.

Grossman [710] said that the rivalry between the departments of radiotherapy and laryngeal surgery, which is so evident in some clinics at present, should be discouraged.

Two hundred fifty-three cases of cancer of the larynx seen in the tumor clinic and the department of radiology at the Massachusetts General Hospital from 1931 to 1949 inclusive were classified by Wang and O'Donnell [711] according to stage of the disease, and the five-year results of treatment were evaluated. They reported that the treatment of early cancer of the vocal cords either radiologically or surgically is attended by a high degree of success. The preservation of a useful voice should make radiotherapy the treatment of choice. In later stages the cures by surgery surpass those of radiotherapy and the sacrifice of the larynx is probably justified.

To Lindsay and Ironside [712] the results attained at the University of Chicago clinics along with those reported from other centers on the treatment of carcinoma of the larynx seemed to warrant several conclusions. In the Stage I glottic lesions, excellent results can be obtained by either radiation or surgery. When quality of the

voice is an important consideration, radiation offers some advantage over surgery, provided that radiation is properly controlled and there is a careful follow-up to detect any recurrence. At the University of Chicago clinics, when the choice of treatment lies between radiation and laryngectomy radiation is advised and any recurrence is treated by laryngectomy. When there has been recurrence, laryngectomy has given almost as good five-year survival rates as when an operation has been the primary treatment. This policy has had the advantage of allowing a certain percentage of patients to retain the voice. In the case of the supraglottic tumor, the impression gained from this series is that surgical treatment offers a better five-year survival rate than radiation.

As far as survival is concerned, Harris, Silverstone and Kramer [713] considered that the results of radiotherapy and surgical operation in comparable material are almost identical. Laryngectomy is indicated for radiation failures whenever any necrosis of the cartilage except necrosis of the epiglottis occurs. When there was fixation of the laryngeal structures, irradiation produced an absolute five-year cure rate of 26%: 33% for intrinsic lesions and 23% for extrinsic lesions. The total number of patients treated between 1931 and June 1947 was 139.

Binkley [714] concluded that 500 kv. roentgen therapy offers a method of controlling intrinsic cancer of the larynx in early stages. With this quality of radiation, the complications are minimal, and the five-year results (60%), though inferior to the best surgical results, compete favorably with the average surgical result. The outlook for the five-year control of the more advanced stages of extrinsic cancer of the larynx has not improved by the use of 500 kv. roentgen rays.

Cantril and Buschke [715] stated that cancer of the vocal cord that has not encroached on the anterior or posterior commissure, with free arytenoid mobility, can be controlled by roentgen therapy with an assurance equal to that felt for laryngofissure and cordectomy. Of those patients who otherwise would have required laryngectomy for reasons of extent of disease, roentgen therapy only or followed by laryngectomy when roentgen therapy was unsuccessful has salvaged 50%. The radiologists should not be discouraged by the trend that causes them to see the more advanced or inoperable lesions. It has always existed and has served to provide them with most interesting and grateful patients. Cantril and Buschke considered operation unnecessary for at least a third of the patients on whom it is done.

Nielsen [716] reported his experience at the Radium Centre of Copenhagen with 235 cases of intralaryngeal carcinoma from 1931 through June 1948. Fifty-four per cent of his patients were free of symptoms for five years. Surgical means were used as an additive supplementary treatment to irradiation. His figures do not represent what can be achieved by operative treatment when given preference as the initial treatment. He did not want to deny that x-ray treatment of intralaryngeal carcinoma is more complicated, costly, and perhaps even more unpredictable than surgical treatment, but he considered it worth while in view of the functional results.

Figures as to the frequency of radiation perichondritis are published seldom. Coutard obtained cartilage necrosis in 60% of the cases treated by roentgen rays at the Foundation Curie. Baclesse had cartilage necrosis in 7.5% of his cases. At the otolaryngological congress in Hamburg in 1951 the incidence of perichondritis after roentgen treatment was reported by some members to be 20 to 30%. With teleradium before the penicillin era, Jacobsson [717] encountered perichondritis in 6% of cases. During the last years he has seen no cases of radiation perichondritis. Proper treatment requires not only an experienced radiotherapist who sees enough cases to keep up his training, but also a qualified physicist for the planning of the dose dis-

tribution. For carcinomas for which laryngectomy could be performed, he has obtained a net five-year cure rate of 54% in 57 cases. Teleradium treatment as employed at the Radiumhemmet in Stockholm is considered the method of choice for radiotherapy for laryngeal carcinoma.

The diagnosis of the recurrent cancer of the larynx or its persistence after radiotherapy may be difficult because of edema and perichondritis. Biopsy may be misleading. Mill [718] emphasized that clinical judgment must be trusted rather than a negative biopsy. A pharyngeal fistula is more likely to appear after teleradium than after operation alone.

In discussing whether irradiation for cancer of the larynx made it difficult to operate later, Macbeth [719] said, "The fact of the matter is that some radiotherapists burn the skin more than others, and some surgeons have greater operating facilities than others." Surgery often is capable of salvaging irradiation failures, but the reverse is rarely true. With presently available techniques, operation is preferable in most cases of cancer of the larynx.

In small countries, centralization of laryngeal surgery is necessary to obtain the best results possible. Reporting from Copenhagen, Falbe-Hansen [720] stated that postoperative complications are not more frequent and not severer in patients who had previous radiation therapy than in those who had no previous radiation. One of their patients who had previous radiation, however, died of enormous gangrene of the neck seven days after operation and another had a pharyngeal fistula after operation, which required a plastic operation.

Culter, Japha, and Peppas [721] used telecurietherapy on 38 selected patients with cancer of the larynx before July 1, 1948. The method of telecurietherapy described failed to cure patients with complete fixation of the cords or with involvement of lymph nodes. In two cases tracheotomy had been performed previously; in five additional cases tracheotomy became subsequently necessary. Necrosis of the epiglottis or larynx proper developed in six cases.

Cracovaner [722] stated that function should be preserved whenever possible in treating cancer of the larynx, but not at the expense of a cure. He considered that whenever feasible a tumor should be removed surgically since this seems to be the more certain way of eradicating the disease. The more extensive the tumor the less likely it is to be cured by radiation therapy. At times a tumor is so extensive that operation is impossible. Then radiation therapy may shrink the tumor to such a size that it becomes possible to remove the remaining lesion surgically.

Rubenstein [723] reported a case of cancer of the larynx treated with x-rays.

Minty and Robertson [724] described an appliance for treating carcinoma of the vocal cord. It consists of a piece of polyethylene sheet which contains radon tubes. The Finzi-Harmer technique of creating a window in the thyroid cartilage is utilized with this appliance.

Metastatic Lesions and Single Cases of Interest.—Weinstein [725] reported a case of intrinsic laryngeal carcinoma in a 19-year-old Negro woman.

King and associates [726] reported a case of primary carcinoma of the larynx, appearing 11 months after the administration of a thyroid-ablating dose of 51 mc. of I^{131}, of which 17.85 mc. was retained for 96 hours.

Faaborg-Andersen [727] presented a case of malignant melanoma of the skin with metastatic involvement of the larynx.

Loughead and Bushnell [728] stated that a review of the literature revealed two acceptable cases of metastasis of renal cell carcinoma to the larynx and three cases of metastasis of malignant melanoma to the larynx.

In 8 of 100 cases of malignant diseases, in which necropsies were performed, metastatic tumors were found in the thyroid and cricoid cartilages. These consisted of multiple myeloma (one case), chronic myelogenous leukemia (two cases), metastasis

from bronchogenic (two cases), prostatic (one case), and mammary carcinomas (two cases). Ehrlich [729] found tumor in the cartilages only when there were both bony metaplasia in the cartilages and generalized tumor involvement of bone.

Sawyer and associates [730] reported a case of obstruction of the transverse colon secondary to a metastatic squamous-cell carcinoma from the subglottic area of the larynx.

Other Lesions.—Kohlmoos [731] reviewed the subject of laryngeal papilloma in children and reported 15 cases. The disorder is self-limited, and tumor growth subsides before the age of 10 years in most instances. Therefore, the optimal treatment is conservative to insure future normal voice.

Hajek [732] reported a case of papillomatosis of the larynx in a child. An effort was made to explain the etiology and pathogenesis. The child was born to a mother suffering from papillomatosis of the genitalia.

Altmann, Basek, and Stout [733] reported on 51 papillomata of the larynx of adults. Of the patients, 38 had single papillomata and 13 had multiple. Eleven showed anaplastic changes; ten had single papillomata. Conservatism in the treatment was stressed.

Rubin [734] reported 26 cases of papilloma of the larynx and reviewed the literature.

A surgical technique via laryngofissure with the use of an acrylic mold was demonstrated by Woodman [735] for treatment of multiple recurrent papillomatosis in which glottic obstruction develops.

McCart [736] reported a case of multiple papillomata of the larynx for which the patient received 9000 r by teleradium.

Five years later implants were found in the trachea and bronchi which showed malignant changes; the patient eventually died from a massive pulmonary hemorrhage.

Holinger, Johnston, and Schiller [737] stated that in a recent analysis of lesions necessitating tracheotomy in infants less than one year of age, 27 of the total of 62 cases (44%) required tracheotomy because of a congenital laryngeal anomaly. Only 11% had neoplastic disease of the neck or larynx.

Congenital hemangioma of the larynx is probably more common than is indicated by reports in the literature. X-ray therapy may be of value in these lesions. Baker and Pennington [738] reported five cases in infants. Two lesions were subglottic and tracheal, and the remaining three involved the epiglottis, aryepiglottic folds and the mucosa over the arytenoid cartilages. All of the patients needed a tracheotomy. All of the patients had hemangiomas about the face, neck or oral cavity in addition to a laryngeal lesion. Laryngeal symptoms were not present at birth but developed later.

Blanchard and Saunders [739] reported a case of chemodectoma of the larynx believed to be the first of its kind recorded. Lateral pharyngotomy was performed to resect the laryngeal tumor and its cervical extension. It seems most probable that this chemodectoma had its origin in the region of the laryngeal ventricle under cover of the ala of the thyroid cartilage and possibly from undescribed precursor cells along the course of the superior laryngeal vessels and nerve.

Andrews [740] reported the case of a glomus tumor of the larynx in a 27-year-old man.

Siegler [741] reported an unusual case of carcinoma of the larynx occurring in a woman with a congenital web of the larynx.

An extensive sessile tumor of the posterior wall of the larynx caused hoarseness and stridor in a boy aged 9 years. MacNaughtan and Fraser [742] recognized it as a granular-cell myoblastoma, and it is the first example to be reported in the larynx of a child. The growth was excised by laryngofissure but recurred seven months later. Radiotherapy was unsuccessful, and laryngectomy was ultimately required.

Maguda and Young [743] also reported a case of granular-cell myoblastoma of the vocal cord. Ten cases in which this tumor has arisen in the vocal cords have been reported previously. They were of the opinion that these tumors are benign and the treatment is surgical excision.

Salkeld [744] presented a case of pedunculated benign lymphoma apparently attached to the arytenoid region. It was thought to be benign, possibly representing "giant-follicle lymphoblastoma."

Ahued V. [745] reported a case of cylindroma originating in the epiglottis.

Howard and Keller [746] and Dwyer [747] each reported a single case of fibrosarcoma of the larynx.

Curtiss and Kosinski [748] and Fenning [749] presented single cases of malignant (amelanotic) melanoma of the larynx.

Neurofibromas involving the larynx may be solitary or a part of generalized neurofibromatosis. Figi and Stark [750] presented five cases: two in patients with generalized neurofibromatosis and three as solitary neurofibromas.

Mikell, Neffson and Daly,[751] Aponte and Vicéns,[752] and McHenry [753] each reported single cases of neurofibroma of the larynx.

Saunders [754] and Dolowitz and Keyes [755] each reported a single case of lipofibroma of the larynx.

Ranger and Thackray [756] presented an interesting case of a patient aged 50 years who had had symptoms referable to the larynx for 20 years. Biopsy revealed diffuse, bilateral papillary cystadenoma of the larynx.

Laff [757] presented a brief survey of cystic swellings in the ventricular area of the larynx and presented three cases.

Hill and Kipen,[758] Kucera and Priest,[759] Scharfe,[760] and Chessen and Luler [761] presented cases of laryngocele.

Baker [762] and Wright [763] each emphasized the importance of vocal reeducation in the treatment of contact ulcer of the larynx.

Ferguson [764] stated that organic lesions of the larynx may be produced by spastic misuse of the voice, that is, vocal nodules, contact ulcers, and certain types of diffuse laryngitis.

Brodnitz and Froeschels [765] treated six patients with nodules of the vocal cords by vocal reeducation by the chewing method of Froeschels. The nodes disappeared in three cases.

Jackson [766] stated that nonspecific granuloma of the larynx is most commonly superimposed on a contact ulcer. This is true whether the initial contact ulcer was caused by direct instrumental trauma or by indirect trauma inflicted by the laryngeal muscular mechanism. The usual site of contact ulcer granuloma is the tip of the vocal process of the arytenoid. It is illogical to attribute all the trauma sustained to the thin mucoperichondrium covering during intratracheal anesthesia only and always to instrumental trauma at intubation.

Maloney,[767] Feinmesser, Aladjemoff and Chayen,[768] Myerson,[769] and Melick and associates [770] discussed the complications of endotracheal anesthesia and presented cases of granulomas of the larynx following endotracheal intubation.

Laryngoscleroma is fairly common in Egypt. Laryngoscleroma may cause laryngeal atresia in three different ways: in the atrophic stage by scabs, in the nodular stage by the masses, and in the cicatricial stage by the contraction of the scar. El-Hakeem and associates [771] stated that chlortetracycline (Aureomycin) gave the most striking curative results in a short time.

Thornell [772] presented a case of the North American variety of blastomycosis of the larynx. Clinically, it may resemble tuberculosis and cancer.

Singh, Yast, and Gladney [773] presented a case of chronic disseminated granulomatous type of coccidiodomycosis involving the skin and larynx.

Burton and Wallenborn [774] reported a case of histoplasmosis of the larynx apparently arrested with ethyl vanillate. When extreme edema with granulomatous lesions is presented in any chronic laryngeal condition, one should be alerted for possible histoplasmosis.

Fisher and Kyler [775] presented a case of Darier's disease of the vocal cords, epiglottis, and interarytenoid space, of apparently 10 years' duration, in a 39-year-old man.

Vitamin A and cortisone seemed to benefit the condition, which is a rare dermatologic disorder.

McCall and Fisher [776] reported four cases of primary amyloidosis of the larynx. Unless surgical removal promises to relieve hoarseness, which is usually the only complaint, operation as a rule is not recommended.

Falbe-Hansen [777] reported two cases of primary laryngeal amyloid in middle-aged men. One was of tumor-like nature, treated with thyrotomy and excision of the tumor. The other one, which exhibited mainly diffuse infiltration, was treated by repeated excisions of small tumors, later by injections of vitamin E for 12 months, and cortisone for 3 months. During this medication, the lesion subsided.

Trachea

Moersch, Clagett, and Ellis [778] studied 82 primary neoplasms of the trachea; of the malignant group, 19 of these were squamous-cell epitheliomas; 18 were cylindromas, and 6 were adenocarcinomas; of the benign group, 22 were papillomas.

Carcinoma, cylindromatous type, is a destructive tumor that probably arises from ducts of salivary or mucous glands and occurs in paranasal sinuses, palate, larynx, trachea, and bronchi. This tumor is infiltrative, grows slowly, and ultimately metastasizes in a considerable percentage of cases. Enterline and Schoenberg [779] reviewed cases of cylindroma of the trachea and bronchi. Cylindromas killed the patient seven times as frequently as did bronchial adenoma, and the cylindroma recurred seven times as frequently as the carcinoid type of adenoma.

Cylindromas are the second commonest malignant tumors of the trachea. Clark, Clagett, and McDonald [780] reported on such tumors of the trachea. Ten of their fifteen patients were dead. A more positive approach to the treatment of this tumor should be taken in the form of early surgical excision when the tumor is surgically accessible.

Because of the tendency of the bronchial adenomas to recur and the possibility of metastasis, treatment should be as radical as possible. Thomsen [781] reported a case of adenoma of the trachea lasting for about 10 years and characterized by repeated recurrence, invasive growth, and finally metastasizing to the lungs.

Elwood [782] described a patient with carcinoma of the trachea in whom the clinical picture was confused by a coexisting fibroma of the pleura.

Bolstad [783] reported a case in which lesions simultaneously present in portions of the lower part of the respiratory tract were widely enough separated to be considered two independent tumors. Lesions of the trachea and bronchus were discovered in the same patient. Microscopically it was said to contain both epidermoid and glandular elements.

Bolstad [784] also reported the 19th case of primary tumor forming amyloid deposits of the trachea and bronchi.

Dorenbusch [785] reported a case of leiomyoma of the trachea.

Foxwell [786] reported a case of a large obstructing chondroma of the trachea arising from the second tracheal ring.

Waldmann [787] reported a case of tracheopathia chondroosteoplastica of the trachea.

Esophagus

Malignant Lesions.—Frequently the dysphagia of early cancer of the esophagus is transient and interrupted by periods of complete freedom from difficulty in swallowing. Boyd [788] stated that every adult who has difficulty in swallowing, even when the difficulty is transient or the patient is apparently neurotic, deserves at least radiological examination by a competent observer.

Hudson [789] emphasized that all symptoms related to the act of deglutition, vague or otherwise, should be investigated with recourse to fluoroscopy, roentgenograms, and esophagoscopy with biopsy and cell studies.

Clagett [790] stated that if carcinoma of the esophagus is to be detected early when conditions for surgical resection are favorable, some means must be developed whereby its presence can be recognized. By the time symptoms are produced, the early stages of development are past.

Parker,[791] too, stated that in order to obtain improved results in the surgical treatment of esophageal carcinoma, primary emphasis must be placed on earlier diagnosis.

Wohl, Pastor, and Karr [792] pointed out that the diagnosis of nonobstructing carcinoma is often delayed because of the absence of dysphagia. The early recognition depends on the awareness of this problem.

Johnson and associates [793] stated that cytological investigation of the esophagus cannot replace biopsy; however, it may prove of value in cases in which for various reasons biopsy is not practical. Severe esophagitis of long standing constitutes the most important source of diagnostic errors. In 30.4% of cases it was not possible to make the definite diagnosis of cancer by the cytological method.

Palmer [794] expected that in a portion of cases of esophageal carcinoma biopsy would have to be attempted several times before a tissue diagnosis can be established. Three important explanations for biopsy failure are (1) intramural position of the lesion; (2) obstruction which precludes access, and (3) simple misdirection of forceps.

Nakayama [795] studied the diagnostic significance of radioactive phosphorus in early cancer of the alimentary tract. This diagnostic method supplied specific information not obtainable by using other forms of examination.

Marshak [796] presented a complete article dealing primarily with the roentgen diagnosis of tumors of the esophagus.

Haas and Baker [797] stated that the direct tumor shadow of the carcinoma in the esophagus is visible in a significant percentage of x-ray pictures taken with adequate technique. Even on plain roentgenograms, the tumor outline is frequently visible.

Haas and Baker [798] stated that cervical roentgenograms are valuable in the diagnosis of esophageal carcinoma. Among the direct roentgen signs are deformities of the pyriform sinuses and the hypopharynx and widening of the prevertebral soft tissue shadow.

Jacobs [799] stated that the double contrast method is of value in that it presents the endoscopist with an accurate idea of the distensability of the esophagus and position and length of any narrowings of the lumen which he will encounter.

Adenocarcinoma arising in the region of the cardia of the stomach and secondarily invading the esophagus may be a different disease, clinically, surgically, and prognostically from a squamous-cell carcinoma arising in the lower part of the esophagus. Andersen [800] stated that operability and resectability rates are higher for the former.

Puestow, Gillesby and Guynn [801] advised ligation of the esophagus in the early stages of resection above and below the tumor to prevent exfoliation and inclusion of carcinoma cells in the line of suture.

Porell, Grenda, and Cooper [802] discussed various aspects of the problem of curability of carcinoma of the esophagus. Their particular interest was in the problem of carcinoma in situ and the prognostic implications.

O'Gara and Horn [803] presented a case of carcinoma in situ of the esophagus showing intramural involvement of almost the entire esophagus without dysphagia. The presenting symptoms were related to metastasis to the cervical lymph nodes.

In order to determine the incidence of inadequate resection, Scanlon and associates [804] studied the microscopic evidence of carcinoma at the margin of resection in the tissue removed by segmental resection of the esophagus for epidermoid carcinoma. Their series consisted of 79 cases. Eighty per cent of the patients in the determinate group were considered to have had inade-

quate resections. Scanlon and co-workers concluded that a greater portion of the esophagus should be excised than is now done in segmental resection.

McCorkle and Blades [805] reported a case of adenocarcinoma of the esophagus. Postmortem examination revealed that the esophagus was completely replaced by gastric mucosa from the cardia to just a few centimeters below the pharynx.

Thomas and Hay [806] reported a case of adenocarcinoma occurring in the lower end of the esophagus and originating from glandular epithelium which lined the esophagus from the esophagosgastric junction to at least the level of the aortic arch.

Steiner [807] stated that the accumulated evidence seems to indicate that carcinoma arises in the esophagus after prolonged injury. Such injury is nonspecific and of either external (for example, alcohol, lye) or internal (for example, achlorhydric anemia) origin. The injuries that eventuate in cancer tend to be greater at the points of anatomical narrowing. The cell hardship that leads to cancer may be inflicted from either side of the epithelial lining and, in some cases, it may be consequent to the cell malnutrition that follows subepithelial fibrosis.

Carcinoma may develop as a late complication at the site of lye stricture of the esophagus. Bigelow [808] presented a case of squamous-cell carcinoma occurring in a lye stricture of 40 years' duration.

Clarke and McConnell [809] published a family pedigree showing six cases of carcinoma of the esophagus in two generations. The disease caused death in all six cases. It seems probable that a genetic factor was primarily responsible.

Mosbech and Videback [810] stated that their study failed to show any hereditary influence. Among 84 men with cancer of the esophagus whose alcohol consumption was known, 65% were classified by their next of kin as alcoholics.

According to the *Cancer Bulletin* (of Texas) [811] carcinoma of the esophagus is the most frequent neoplastic disease in Curaçao. The incidence in males and females is almost equal, and esophageal cancer is more frequent than in any other country.

Crenshaw and Booher [812] stated that a review of the literature revealed 18 previously reported cases in which cancer developed in achalasia of the cardia. They presented the case of a 54-year-old man with a 27-year history of achalasia in whom cancer subsequently developed in the lower third of the esophagus. Groves [813] presented two such cases.

When all the available facts about esophageal cancer have been reviewed, it does not seem likely that any more radical operation than is presently being done, even if it were possible, would bring about any more cures. Harris, Tyner, and Bradshaw [814] stated that the inherent biological predeterminism of the esophageal cancer cell probably has more to do with the outcome than any change surgeons might make in their attacks on it.

Garlock [815] stated that it is more important to know what the chances of long-term survival are with an operable cancer of the esophagus than the chances of a short period of relative comfort after a palliative operation for an inoperable tumor. If cases in which resection is possible are considered as a separate group, the relative long-term survival rate in this group is entirely different from the dark-hued picture painted by some. For the absolute cure rate all patients are included for statistical survey; for the relative cure rate only patients operated on with the avowed purpose of obtaining a cure are included.

Sweet [816] stated that in carcinoma of the midthoracic and lower part of the esophagus the operation of resection with esophagogastric anastomosis gives worth-while palliation. When cases are classified by the surgeon as curable and incurable, the results in terms of five-year survival after resection for the curable lesions were 14% in cases of carcinoma of the midthoracic segment

and 34% in cases of carcinoma of the lower part of the esophagus and cardia.

To Garlock and Klein [817] there is no justification for the spirit of defeatism which has crept into the literature in the past few years. The over-all five-year survival rate of patients operated on for cancer of the esophagus, excluding operative deaths, was 27.2%.

Between the years 1945 and 1952, 475 patients with malignant tumors involving the lower portion of the esophagus and the cardia were seen at the Mayo Clinic. The lesion was considered inoperable in 219 cases. Surgical exploration was carried out on 256. In 131 instances resection was possible. In a number of these the operation was a palliative procedure only. Hospital mortality was 16.7%. The three-year survival rate was 32%. The five-year survival rate was 24%. Carey and Claget [818] stated that, although the surgical treatment of the malignant lesions involving this region carries considerable risk, the results are comparable to those from surgery for cancer in other fields.

Adams [819] stated that the present wave of pessimism regarding surgical therapy for carcinoma of the esophagus is unjustified.

When cancer of the esophagus is recognized early and treatment is instituted early, Puestow [820] stated that the operative mortality will be no higher than that of other major operations and that cure of malignancy of this organ will be higher than cure of malignancy of the stomach.

Klein and Garlock [821] presented their experience with a series of 401 patients operated on for cancer of the esophagus and cardia. Their results justify continuation of an aggressive surgical attitude toward this disease.

Wilson, Powers, and Johnston [822] favored resection for carcinoma of the esophagus, regardless of the location, if there is a possibility of completely removing the tumor tissue.

Holmes [823] stated that all patients with esophageal obstruction due to tumor are entitled to an exploration of the abdomen and esophagus for consideration of resection or some other palliative procedure unless impaired cardiovascular function or pneumonitis contraindicates the procedure.

Parker and Jenkins [824] stated that they treated 42 patients with cancer of the esophagus by resection, and the average operative mortality was 56%. The most frequent cause of death was failure of healing of the anastomosis with fistula and empyema.

May and Etheredge [825] reported a rare case of a successful resection of a recurrent carcinoma of the esophagus.

Shedd, Crowley, and Lindskog [826] studied 180 patients with carcinoma of the esophagus. Seventy-four were considered candidates for exploration: thirty underwent resection; six died after resection; three of the thirty are surviving. No patients with epidermoid carcinoma survived longer than 27 months.

Brown [827] reported a series of 50 unselected cases of cancer of the esophagus. Only seven patients could be treated by radical resection; two died from the operation, and five were alive and well.

Stranahan, Gobbel, and Olson [828] studied 64 cases of carcinoma of the esophagus. Esophagoscopy permitted biopsies positive for tumor in 86.3%. Esophagograms furnished evidence of cancer in 95.6%. The average survival time was 5.2 months for those receiving roentgen therapy; 6.3 months for those receiving no therapy; 7.3 months for those having gastrostomy only, and 9 months for those having resection.

Nakayama [829] stated that cancer of the thoracic portion of the esophagus can be cured by radical surgical treatment just as can gastric carcinoma. For carcinoma of the upper and middle thoracic portions of the esophagus he recommended the transdiaphragmatic thoracoabdominal approach from the right.

Creech, Overton and Erickson [830] reported a case of leiomyosarcoma of the esophagus. Twelve others were collected from the literature.

Lipschultz and Fisher [831] reported another case of leiomyosarcoma of the esophagus.

Boyd and associates,[832] Pomeranz and Garlock,[833] Loring and Zeppa,[834] and Robertson [835] reported cases of malignant melanoma of the esophagus.

Bell [836] reported a case of fibrosarcoma of the esophagus.

Demuth [837] reported a case of rhabdomyosarcoma of the esophagus.

Surgical Methods for Malignant Lesions.

Conerly, Carlson, and Scott [838] described a surgical approach for carcinoma of the upper thoracic portion of the esophagus. This approach involved use of the supine position, with anterior exposure through combined cervical right thoracic, and abdominal incisions. This plan was advocated for the technical management of carcinomas at all but the lowest levels of the thoracic part of the esophagus.

Moore [839] recommended an approach through left paramedian and fourth right intercostal incisions which are joined through the sternum. The patient does not need to be turned during the operation.

Hurley [840] and Nakayama [841] both described incisions for the approach for the surgical treatment of carcinoma of the esophagus.

Heimlich and Winfield [842] described a one-stage operation for replacing or bypassing the esophagus which had been successfully performed experimentally. This procedure ultilized a tube which is created from the greater curvature of the stomach and retains its attachment to the cardia.

Mahoney and Sherman [843] and Sherman and associates [844] reported the use of a retrosternal transplant of the colon for reconstruction of the thoracic part of the esophagus following esophagectomy for carcinoma. A brief historical review of esophagoplasty and the rationale of esophageal reconstruction with colon were presented also.

Sanger [845] stated that heroic and radical resection for far-advanced cancer of the esophagus leaves much to be desired. Conditionally and with reservations, he proposed a by-passing operation in which the esophagus is anastomosed to the stomach, and the tumor is left in situ.

Andreassen and Therkelsen,[846] McCook, Williams, and Fey,[847] and Walker [848] presented small series of cases of cancer of the esophagus.

Berman [849] stated that in concentrating an attack on the disease (carcinoma of the esophagus) the regard for the patient has become secondary. The short survival and high mortality after conventional procedures should make physicians reflect on the fact that the intrinsic nature and the anatomic relationship of this disease make it not suitable for true cancer surgery. The polyethylene prosthesis seems to offer hope, but not for the principal factor, that of increased survival time with possibility of cure. If used correctly, it will allow many more patients a few years' survival by dint of the low operative mortality. The patients' remaining years will be comfortable and they will have the ability to eat.

Maynard, Rothman, and Naclerio [850] summarized their experience with 14 cases of carcinoma of the esophagus in which a polyethylene tube was used as a palliative prosthesis. In four of the five cases in which the tube was inserted without resection the results were satisfactory. In eight of the nine cases in which the esophagus was resected and the plastic tube was used to bridge the gap, major complications resulted. Two patients died in the immediate postoperative period.

Wawro [851] discussed the fatal complications in two patients who had undergone resection of the esophagus and intrathoracic insertion of plastic polyethylene tubes to restore esophageal continuity.

Shackelford and Sparkuhl [852] reported a case in which esophageal continuity was restored with a plastic tube. There was a report of the findings after death, 183 days after the operation.

Heimlich, Greenlees, and Winfield [853] described an operative technique by which a

plastic tube is introduced into the esophagus through a cervical incision for purposes of palliation for inoperable carcinoma of the upper and middle thirds of the esophagus.

Leborgne[854] stated that with proper technique, filiform tubes can be passed through the esophagus in 90% of patients with advanced stenosis due to carcinoma.

Davidson[855] described a method of puncturing the cervical portion of the esophagus with a trocar and cannula. The cannula is used for the introduction of a thread in order to anchor a tube passed through a malignant stricture of the esophagus. The cannula also may be used as a means of introducing a slender polyethylene tube into the esophagus.

Coyas[856] described the apparatus and technique of inserting perorally a tube through a stenosing neoplasm of the esophagus for palliative intubation in carcinoma of the esophagus.

Radiation Therapy for Malignant Lesions.—Adler and Deeb[857] stated that radiation therapy for carcinoma of the esophagus should be used more frequently and radically in all cases in which operation cannot be used or only incomplete resection can be done. The negative attitude towards radiation therapy for cancer of the esophagus is not justified.

Buschke[858] considered radiation therapy of the esophagus preferable to operation in the treatment of cancer in the cervical segment as long as surgery cannot offer more consistent permanent results.

To LeClaire[859] radiation therapy was a more rational method of management of far-advanced carcinoma of the esophagus than gastrostomy which, in most instances, is accompanied by mental depression.

Esophageal cancer is rarely diagnosed early. When it is diagnosed, operation is usually the first therapeutic approach, radiotherapy being reserved as a palliative measure. The patient is usually dead within five years regardless of treatment. According to the *Cancer Bulletin* (of Texas),[860] however, if the potentialities of the betatron are realized, radiation could well become the favored treatment.

Adams and Smedal[861] stated that surgical intervention is essential to remove the primary lesion and to establish functioning continuity of the upper part of the gastrointestinal tract. For any residual local extension or lymphatic involvement beyond the field of surgery they used supervoltage therapy. An over-all survival rate of 31.6% in a series of 38 patients gave some reason for encouragement.

Noyes and Iverson[862] presented six successive cases of high esophageal carcinoma treated by resection and immediate esophagogastrostomy.

Benign Lesions.—The clinically significant benign tumors of the esophagus fall into two main categories, the intraluminal polypoid type, and those arising from the muscle wall, the leiomyomas. Kirschner[863] stated that esophagoscopic diagnosis and removal are the methods of choice in the treatment of the first group. Transthoracic excision is the recommended therapy in the second group.

Sweet and associates[864] reported finding 22 tumors of the muscle wall of the esophagus; 12 of these, 1 malignant and 11 benign, were removed surgically.

Boyd and Hill[865] presented 15 cases of benign esophageal tumors including 9 of leiomyoma, 2 of cyst, 2 of fibroma, 1 of polyp and 1 of hemangioma.

Puestow, Gillesby, and Powers[866] reported 12 benign tumors of the esophagus from Hines Veterans' Administration Hospital.

Schiebel and Cleaver,[867] Piacentini,[868] Oxley,[869] Caputo and Norlin,[870] Schluger, Arcomano, and Cardon,[871] Flavell,[872] Wilder and Moore,[873] Rabinovitch, Nissen, and Rabinovitch,[874] Storey and Adams[875] all reported cases of leiomyoma of the esophagus.

Callanan,[876] and Frank, Reiner, and Fleischner[877] reported cases of leiomyoma of the esophagus, one associated with esoph-

ageal squamous carcinoma and the other with squamous carcinoma of the thymus.

Johnston, Clagett, and McDonald [878] reported 21 cases of leiomyoma of the esophagus and 5 cases of leiomyosarcoma. There was a thorough review of the world's literature.

Kinnear [879] reported a submucous, nonpedunculated lipoma of the esophagus.

Most polypoid esophageal tumors described in the literature have originated in the region of the cricopharyngeus muscle, where the wall of the esophagus is very thin and pliable. Lodmell [880] reported a case of polypoid tumor which extended from the cricoid area to the cardia. Fortunately, the tumor could be removed through a simple esophagotomy through the neck since the pedicle was attached near the cricopharyngeus muscle.

LeJeune [881] reported a fatal case of benign pedunculated esophageal tumor in a 36-year-old man. Following a bout of coughing, the tumor was regurgitated from its position in the esophagus and became lodged into the aperture of the larynx, filling it completely.

Lorimer and Rothberg [882] reported a case of pedunculated esophageal tumor in an elderly man.

Habein and associates [883] reported 201 cases of diverticula low in the esophagus seen in 10 years. In 24 of these cases, transthoracic removal of these esophageal-pulsion diverticula was performed. Emphasis was laid on the results of operation as they affect the selection of cases for surgical treatment.

Creech and DeBakey [884] reported two cases of ciliated epithelial esophageal cysts with associated cardiac abnormalities.

Fletcher and Takaro,[885] and Reynolds [886] discussed the principal lesions of the esophagus which are amenable to surgical treatment.

Adams and Luria [887] described a variety of infrequent pathological processes occurring about the lower part of the esophagus, the diaphragm and the cardia.

Putney [888] summarized the bibliographic material available in relation to bronchoesophagology for 1954.

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Plastic Surgery

Summaries of Bibliographic Material Available for 1956

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Homografting

The possibility of successfully transplanting tissues from one human being to another has long been of interest to both clinicians and research workers. Up to this time, however, one may say that no adult tissue exists which can be successfully and permanently transplanted from one human being to another, preserving its normal structure and its original living cells. Two possible exceptions to this statement are the cells in homogenous grafts of cartilage and those in the interstitial portion of cornea. In both of these cases, however, the tissues are avascular, and the cells are protected by a muco-protein-like matrix, which prevents the entrance of hostile host cells.

The generally accepted theory regarding the rejection of homografts is that of an actively acquired immunity. According to this concept, the homograft liberates some product which stimulates the formation of a specific antibody. This antibody causes destruction of the cells in the transplant and gradual necrosis of the graft.

Up to some 18 months ago we concurred in the general opinion of other investigators that skin homografts were always rejected a short time after transplantation, with the exception of transfers between identical twins, to patients with agammaglobulinemia, and to some burned patients in whom there appeared to be a physiological need for skin. This concept was firmly grounded among experienced surgeons and research workers. The experience of one of us (L. A. P.)[1] with a transplant from mother to infant, which was tolerated for eight months, and the long survival of other skin homografts carefully followed by our group,[2] however, have changed our viewpoint based on factual evidence. Skin grafts exchanged between parents and infants in 32 cases demonstrated that *all transplants between father and child were rejected.* About 25% of the skin grafts exchanged between mother and child, however, enjoyed a long survival time, which extended up to 13 months in one case. This long survival time of some skin grafts exchanged between mothers and infants in our series is possibly due to an actively acquired tolerance caused by an exchange of blood cells between the pregnant mother and the developing embryo during the mother's pregnancy. When skin grafts interchanged between mothers and infants are rejected, there is possibly a more complete separation of maternal and fetal circulation during the pregnancies of these mothers.

Children who are tolerant to their mother's skin may also tolerate other tissues from their mother, such as cartilage. For this reason we are doing routine skin exchanges between mothers and children in cases where the child has a congenital absence of the auricle. When the mother's skin is tolerated by the child, it may be expedient to use the mother's cartilage for structural support of the new ear, on the basis that cartilage as well as skin will be tolerated by this child.

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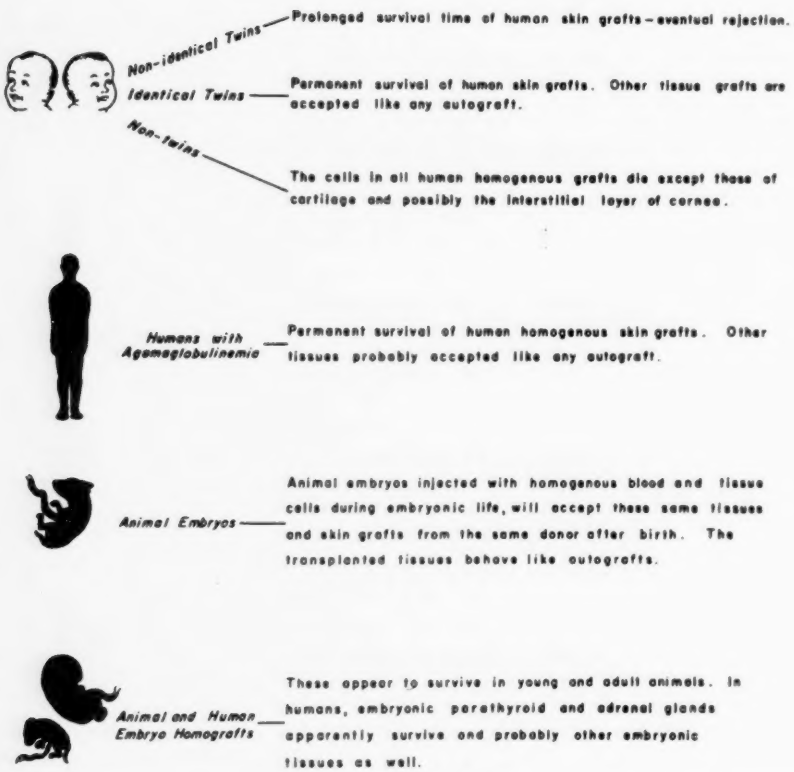
Non-identical Twins
Prolonged survival time of human skin grafts – eventual rejection.
Identical Twins
Permanent survival of human skin grafts. Other tissue grafts are accepted like any autograft.
Non-Twins
The cells in all human homogenous grafts die except those of cartilage and possibly the interstitial layer of cornea.
Humans with Agammaglobulinemia
Permanent survival of human homogenous skin grafts. Other tissues probably accepted like any autograft.
Animal Embryos
Animal embryos injected with homogenous blood and tissue cells during embryonic life, will accept these same tissues and skin grafts from the same donor after birth. The transplanted tissues behave like autografts.
Animal and Human Embryo Homografts
These appear to survive in young and adult animals. In humans, embryonic parathyroid and adrenal glands apparently survive and probably other embryonic tissues as well.

Fig. 1.—Behavior of homografts. The prolonged survival of skin exchanged between nonidentical twins has been reported as 20 days. This, however, merely approximates the tolerance of some skin grafts exchanged between father and infant and does not meet our standard of relative tolerance, which is a minimum of 30 days.

Face, Scalp, and Skull

Robinson's[3] article on the management of facial injuries is well written and covers the subject comprehensively. He points out that facial wounds showing little reaction may be primarily repaired with safety as late as 48 hours after injury. All dead spaces must be completely eliminated to prevent the formation of edema and hematomas, which will result in scarring.

All necrotizing ulcerations of the face, as stated by Ye, Robinson, and Hamilton,[4] tend toward progressively fatal termination. In the case reported, the condition was described as a chronic inflammatory process which progressed, in a period of a few months, to a fatal termination by invading the whole face and surrounding tissue in a burrowing and necrotizing manner. Extensive attempts failed to demonstrate etiologic factors amenable to treatment, and the authors failed to alter the progressively fatal course of this disease, although antibiotic drugs were given in large doses as indicated. It is thought a significant role may have been played by thick-walled and thrombosed blood vessels with tissue destruction comparable to that associated with the vascular disturbance in Wegener's disease.

In a well-written article Stamm[5] describes fibrous dysplasia of the facial bones. Its monostotic and polyostotic forms, with and without Albright's syndromes, are dis-

cussed. He calls attention to good points in differential diagnosis of this disease from Recklinghausen's osteitis, fibrosa cystica, osteoporosis, xanthomatosis, Paget's osteitis deformans, and osseous neoplasia. The history and clinical course of three cases are reported.

In Rowland's[6] opinion, no technique is as satisfactory as multiple excision by the French method of the advancement flap after removal of large facial angioma. The cosmetic success in removing large angiomas or port-wine stains from the face and periodic use of advancement flaps is demonstrated by a case. An accompanying ptosis of congenital origin was repaired by the Trainor method of utilizing a rectangular strip of the tarsus itself as a sling under the superior rectus.

Conley[7] draws attention to the hazards of late radiation degeneration with cancerous formation. In the majority of these conditions local excision and desiccations are carried out as the clinical course dictates. Conley emphasizes the seriousness of multiple or repetitive squamous-cell cancers and degeneration in postirradiation dermatitis. Three surgical methods of treatment described are single stage operations designed to replace the epithelial covering of the face by either pedicled flaps rotated from the neck and scalp or the application of free skin grafts. The pedicled flaps from the neck are preferable, but sometimes the skin of the neck has been affected by radiation degeneration, scarring, cancer, or metastases and is not satisfactory for transfer. In these instances free skin grafts are used.

When full-thickness soft tissue has been lost and the bony structure of the face marred, the scalp pedicled visor flap has advantages in the male. Minor touch-ups about the nose and eyelids are required in some instances, but the curative and esthetic results are gratifying.

Grotting[8] discusses sinus tracts associated with the anterior face and neck rather than the lateral areas where congenital anomalies are commoner. If the defects are acquired, they may be acute or chronic infectious conditions of specific or nonspecific nature,

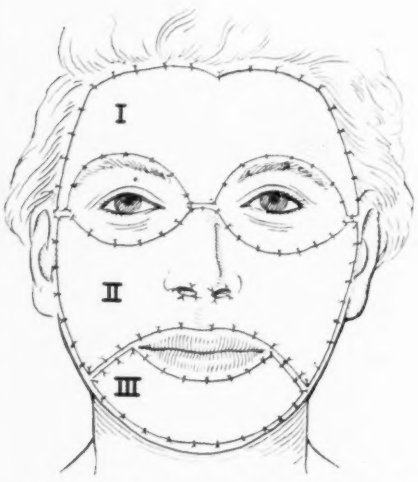

Fig. 2.—Replacement of skin of face, exclusive of eyelids, with three free, thick-split skin grafts. Microstomia and ectropion are not complicating factors. (From Conley, J. J.: Surg. Gynec. & Obst. 102:581-587, 1956, by permission of Surgery, Gynecology & Obstetrics.)

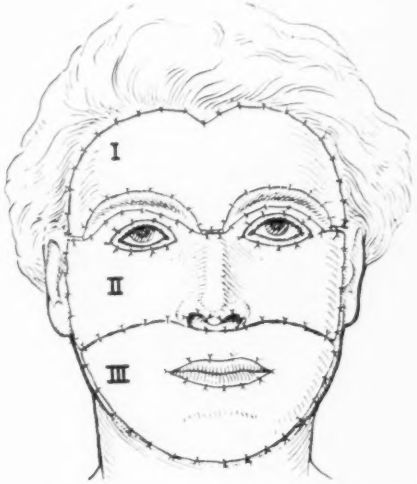

Fig. 3.—Replacement of skin of face, including eyelids, with three free, thick-split skin grafts. The tendency toward ectropion is minimized by this graft-slitting technique. The tendency toward microstomia is increased. (From Conley, J. J.; Surg. Gynec. & Obst. 102:581-587, 1956, by permission of Surgery, Gynecology & Obstetrics.)

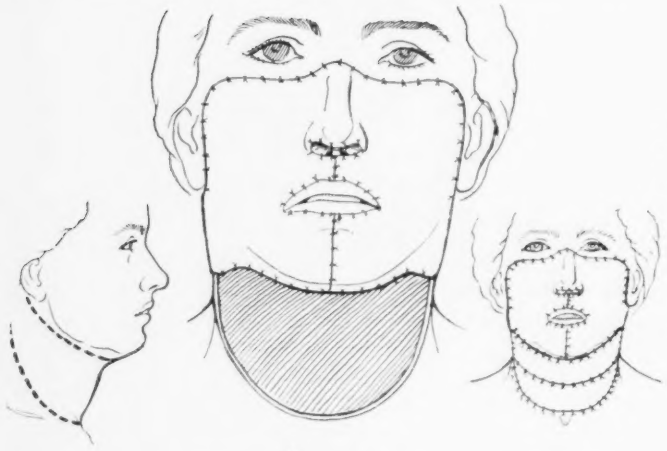

Fig. 4.—Replacement of skin of face by rotating neck flaps. These flaps are cut according to measurements of the face wound. The donor area is dressed with one or two free skin grafts. (From Conley, J. J.: Surg. Gynec. & Obst. 102:581-587, 1956, by permission of Surgery, Gynecology & Obstetrics.)

or they may be degenerative conditions. Malignancy must always be suspected until ruled out. On the first examination by Grotting in one case, pressure was made extraorally along the tract and intraorally near the teeth, causing drainage to exude. He stresses the great necessity for thorough investigation of the differential diagnosis, and advises the use of intraoral occlusal films from several angles. He presents four cases to illustrate his points.

Conroy [9] reports a case of facial paralysis in which he utilized the temporalis muscle. He modified the method originally described by McLaughlin, who used the temporalis muscle and included sectioned coronoid process. A satisfactory result was obtained by Conroy by utilizing the anterior half of the temporalis tendon in combination with extensor digitorum longus tendons to the toes.

Cowan [10] presents a very ingenious method for reconstructing the eyebrow. He discusses the four previously described methods and their disadvantages and points out the advantages of his method, especially the assurance of survival of all transferred hair follicles. An up-and-down flap based on the frontal hair line of the opposite side of the forehead is used. Objections to his method are noted. A case of reconstruction of the eyebrows is also reported by Tanzer.[11] In a patient with pili torti the eyebrows were reconstructed by free grafts of scalp containing hair. After a period of nine months, it was necessary to add a second set of grafts from the parieto-occipital region.

In correction of wrinkles, Gonzalles-Ulloa [12] uses what he calls "an ear-island" method, tracing the line of incision along the frontal region and describing a circle around the pinna to join the preauricular incision. His lines of incision are radical; they completely encircle the head, and adjustment is made by four triangles. He undermines the skin much more widely than by more conventional methods. An extensive detachment is effected in the direction of the eyebrows and posterior region, leaving the periosteum exposed, and the edges are sutured. The skin is detached from the temporal region to the opposite posterior auricular area and sutured. Further, extensive detachment is made in the mastoid and occipital regions. Stretching of skin and use of steel as suture material are indicated.

A case of congenital absence of the scalp and skull is presented by Conway and Johnson.[13] They give a brief review of the literature on the subject, and present two additional cases of such a congenital defect of the scalp and two cases of total osteocutaneous defect of a portion of the head. With words and with illustrations they describe the manner in which an abdominal

pedicled flap was used to cover the defect of the scalp. The aim of treatment should be toward immediate coverage of the granulomatous defect with a skin graft, unless it is small enough to close spontaneously.

EDITORIAL COMMENT: Conway and Johnson fail to include a similar case, with fatal termination, reported by Peer and Van Duyn and published in "Plastic and Reconstructive Surgery" for 1947-1948.

A case in which there was an extensive long-standing loss of scalp, with osteomyelitis of the exposed skull, is reported by Vallis and Humphreys.[14] They emphasize the value of the radical surgical approach to extensive osteomyelitis of the skull in treating the patient in this case, and they demonstrate the excellent blood supply of the scalp, which permits large pedicle flaps to be prepared and transferred without delay. In this patient Vallis and Humphreys removed all infected necrotic bone, and the involved portion of the inner table. Granulations utilized to fill out large defects of the skull form a firm protective vascular bed over exposed dura and bone.

Nose

In an earlier cumulative review by us (in 1947-1948) we pointed out the valuable points concerning rhinoplasty as brought out by Safian, which are again emphasized in his present article.[15] To quote, "A rash of illogical procedures was being advocated by a group whose basic aim seems to have been to achieve headlines in medical literature." Further, he violently opposes the unorthodox nomenclature, for he believes that it can lead to complications. He discusses how many of Joseph's descriptions have been misinterpreted. Inconsistencies and departures from long-established factors are evaluated. Safian feels that a more careful policy of editing material submitted for publication would be of great benefit to the beginner in the practice of rhinoplasty.

In Reidy's[16] opinion, the credit for development of the field of corrective rhinoplasty must go to Joseph of Berlin. As stated by Reidy, it is as easy to overcorrect as undercorrect nasal deformities.

In Great Britain general anesthesia is commonly used in operating on the nose, with or without the use of hypotensive drugs. The general nasal reductions are outlined by Reidy in surgical steps and several of the complications are discussed. Drawings are included, and the proportions of the face are pointed out.

For study of the face in plastic surgery of the nose, Becker[17] presents a few of the important anthropometric measurements and labels designated points of the face. A few of the important measurements and landmarks—the cephalic index, the facial index and the facial angle—are evaluated in developing an artistic concept when considering the anatomical factors involved in corrective rhinoplasty. The technical aspects in corrective surgery are illustrated.

Cohen[18,19] presents one article on the rhinoplastic complications occurring during operation, and in a second article, those occurring postoperatively. Six operative complications of rhinoplasty are listed: hemorrhage, incomplete fracture of the nasal process, splintering the nasal processes or the nasal bone, breaking of the saw, blood clots, and errors involving the cartilages. Further, Cohen gives three essential reasons for the performance of secondary operations: 1. The results do not satisfy the patients, or there are legitimate shortcomings in the operations. 2. The same procedure does not give similar end-results in all cases. 3. Errors in technique in the performance of the primary operation make recorrections necessary.

Among postoperative complications are unequal nostrils, contraction and nostril deformities due to residual unlined areas in the nostril vestibule, protrusions near the tip caused by projection of cut edges of the lower laterals or by excessive skin bunching, alar retractions or dents, nostril flaring, and a flat ala or depressions. The most frequent postrhinoplastic complication is the lowering of the nasal tip. Variations of the broad

nasal tip, columella abnormalities, intranasal adhesions are given consideration together with miscellaneous complications. The corrective measures for these various complications are given in considerable detail.

Robinson,[20] of England, reports one case in which he repaired burn deformity at the top and alae of the nose by using a composite auricular graft, 8 cm. in length, with a pleasing result.

EDITORIAL COMMENT: It is questionable whether to produce such a large deformity of the ear is esthetically advisable.

Composite grafts were used by Conley and Vonfraenkel[21] for partial reconstruction of the nose. They like the method of cooling the tissues, which is applied without damage to the skin or supportive tissues.

The physiological effects of cooling upon the tissues are reviewed, and these principles were applied in 12 consecutive composite grafts of the nose. The technical steps in procuring and fixing the grafts are given in detail. In these cases severe postirradiation changes, ulceration, and postsurgical scarring were observed. From a nutritional standpoint the recipient grafting bed was considerably below average. Of the 12 grafts, 10 "took" perfectly. Five of these were implanted upon other transposed pedicled flaps on the nose. Five were implanted on noses that were not ideal as recipient sites. The range of the grafts was from 1 cm.×1 cm. to 2 cm.×2 cm.

A fall of approximately 38 F in temperature within the supportive dressing and 17 F in local skin temperature was brought about by constant application of ice and ice compresses. Conley and Vonfraenkel believe that this cooling phenomenon in this area enhanced the "take" of these composite grafts in these difficult circumstances by decreasing the biological activity demands of the graft until normal physiological processes had attained the level of survival.

Crawford[22] describes a modification of the standard method of transfer of "clavicular" tubed pedicles to the nose, which allows a tube of convenient length to be used and also avoids the creation of an additional scar on the face. The procedure is carried out in five stages: (1) a double pedicled flap 5½ by 1½ in. is raised in the clavicular region to the central portion tubed; (2) the lateral end of the tube is divided and inset into a submandibular defect as in the standard method; (3) a U-shaped flap of mucosa and submucosa is raised on the inner aspect of the lower lip close to the angle of the mouth and rotated externally, the raw surface external; (4) the submandibular attachment of the tube is divided and inset into the nasal defect, and (5) the mucosal flap is returned to the inner aspect of the lip. The method has been used in seven cases with satisfactory results.

In 1946 Kazanjian[23] published a paper on median forehead flaps in the repair of nasal defects. In the present paper he reemphasizes the practical application of this flap as a simple and direct means for the repair of defects of the nose and surrounding areas. As pointed out by Kazanjian and Roopenian, the Gordon New "sickle flap" and the Converse "scalping flap" are useful for total rhinoplastic restorations in which the median flap may not supply a sufficient amount of skin. They present the surgical techniques for raising the flap and for closure of the resulting wound. Several cases are presented illustrating the use of the flap for reconstruction of surface defects as well as of full-thickness defects.

Smith[24] discusses autogenous bone grafts as applied to rhinoplasty. He prefers to use bone from the iliac crest and inserts it into frontal bone after rhinoplasty and submucous resection, with fixation of Kirschner wire according to the method of Farmer, through the skin and the dorsal graft. He describes some experimental work on the skull of rats, where he feels the matrix was gradually replaced by new bone. The animal experiments are suggestive evidence as to the fate of cancellous bone grafts and

indicate the method by which the graft survives or dies.

To overcome postoperative elongation (drooping) of the nose, as considered by Fomon et al.,[25] it is essential to produce an appropriate angle between the nasal base and the lip. They discuss and illustrate several different methods of correcting this deformity. The short columella still remains a contraindication to cosmetic rhinoplasty. A return to the original state (dropped tip) is inevitably caused by methods to fix the basal structures to the septal cartilage under tension. The columella can be lengthened moderately at the expense of width or by the addition of tissues from the floor of the nose. Fomon and his associates regard as inadvisable for the ordinary rhinoplasty the use of advancement of tissue from the lip or of contiguous flaps.

In a well-written article Dingman[26] discusses the different methods of correcting nasal deformities due to defects of the septum. He points out the value of rearranging misplaced normal cartilaginous components of the nose whenever possible. Several methods of building up the depressed nose with different types of grafts are considered.

In discussion of a rapid approach to the deviated septum Fuchs[27] outlines a procedure which proved to be applicable to the common deviations of the nasal septum. When a deviated septum contributes to the nasal deformity, a modified submucous resection of the septum and a rhinoplastic operation should be carried out in one-stage procedure. Large segments of septal cartilage should not be excised. Further, the vomer and perpendicular plate of the ethmoid must not be removed, as this upsets the stability of the nose. The outlined procedures are concerned primarily with an esthetic result, but bony spurs, cartilaginous thickenings and deflections may persist and can be corrected by further septal surgery at a later time. In Fuchs' experience a second operation is rarely required.

Climo[28] describes and illustrates surgical closure of a large anterior perforation of the nasal septum. He did this by joining two double-pedicled flaps, the superior one larger and of major significance, and the inferior one smaller and of less significance. Both flaps are richly nourished by the posteriorly and superiorly derived blood supply. The aim of the technique is to mobilize an adequate superior mucoperichondrial and an inferior mucoperiosteal double-pedicled flap. The superior double pedicle is increased by inclusion of a portion of the available membrane reflected from the dorsal border on the side walls of the nose.

Eye

A primer on plastic surgery of the eyelids is presented by Pickrell and his associates[29] for the general surgeon. Because of their abundant vascular supply injuries to the eyelids are quite resistant to infection and tend to heal rapidly but with disfigurement, unless the repair is performed with the most careful coaptation of the wound margins. All lacerations are of special significance because of possible danger or injury to the eyeball or bony orbit. The direction of the wound governs the type of injury resulting. Débridement should be carried out sparingly; every fragment of viable soft tissue and skin should be preserved. The authors present methods of repairing fresh lacerations of the lids. A method of vertical through-and-through lacerations of the eyelid is demonstrated diagrammatically. Further, Pickrell et al. discuss methods of treatment and repair of benign and malignant lesions of the eyelid.

Some of the reasons for success in grafting skin and mucous membrane to the eyelids and socket are outlined by Singer.[30] He points out the basic principles in grafting and considers conjuctiva itself the best material to replace conjunctiva. Since there is very little conjunctiva available, the next best substitute is buccal mucosa. This must

be removed in very thin sheets without the submucosal fat.

When the eyeball is present in reconstructing the socket, irritation of the cornea with ulceration and sloughing may result from epidermis or from fine hairs (secondary to the trauma). If one chooses a skin graft to line a socket, it is best to remove all conjunctiva and to reline the entire socket with skin.

According to Crawford,[31] at the Hospital for Sick Children in Toronto, a much higher percentage of satisfactory results was obtained when fascia lata was used in ptosis repair than by other means. He describes with illustrations his method of using fascia lata taken from the thigh. The incisions in the forehead are made 7 mm. above the brow, and the lid is pulled up 2 mm. more than desired for the final result.

The higher percentage of satisfactory results applied to all types of ptosis, including those with good levator action. The largest percentage of cases in the series had limited levator action and so were best suited to this type of operation.

The purpose in restoring the conjunctivonasal flow of tears, as pointed out by Ashley,[32] is to prevent epiphora, but in this article he is concerned with the problem of combined obstruction or lack of patency of the entire nasolacrimal apparatus. He outlines a method of reconstructing the entire nasolacrimal apparatus in which he uses polyethylene tubing in continuity through the upper and lower puncta and nasal cavity. This tubing is covered with a tubed skin graft, raw surface outward, for lining the new tract. The polyethylene tubing through the punctum did not seem to seriously inhibit the ciliary action of enhancing the flow of tears into the canaliculi.

Two cases out of a series of six cases are reported to illustrate the combined problem. The six cases are divided into two categories: obstruction or lack of continuity due to unintentional trauma; absence of the lacrimal apparatus following surgical excision of a regional tumor. In the one patient, with tearing from an unsightly left orbit, the cavity which represented the site of the obliterated lacrimal sac was lined with a tubed split-thickness skin graft around the polyethylene catheters, raw surface outward, and the skin incision was closed with interrupted simple nylon sutures.

The polyethylene tube remained in position for six weeks, with both subjective and objective improvement. Repeated irrigation of the conjunctivonasal passage, from the time of removal of the polyethylene tube to the present, revealed it to be patent. It remains to be seen whether it will constrict at a later date.

Ear

Peer[33,34] recommends free autogenous fat grafts with the overlying dermis as the best available grafting material to establish normal contour in underdevelopment of one side of the face, often accompanying an absent external ear. The graft, which is removed from the patient's abdomen, is introduced through an incision in front of the ear as in a face-lifting operation. The fatty portion of the graft will lose about 50% of its bulk after transplantation, and the transplant should therefore be in excess of the actual requirement. Peer believes from his experimental evidence that the fat cells remaining in the graft eight months or longer after transplantation represent the original fat cells and not replacement cells from the surrounding host tissue. If patients take on an increase in abdominal fat, the transplanted fat graft will also take on fat. If the patient loses abdominal fat, the graft will likewise give up fat and normal contour will be reestablished. This, in his opinion, is good evidence that the original fat cells survive transplantation as living entities. The grafting of fatty tissue from one patient to another is a useless procedure since all living cells in the homograft die and the transplant is replaced by host fibrous tissue. This host fibrous tissue is small in bulk and does not serve as a

satisfactory substitute for the transplanted fat.

White, Rubin and Walden[35] describe a method of total ear reconstruction. In this method they roll a hair-bearing portion in the ear area upon itself and cover this defect with a thick split-skin graft. Several months later the graft area is lifted, and polyethylene implants are inserted beneath it. The graft is wrapped around these implants, and the hair-bearing area is unrolled and is brought behind the reconstructed ear. They state that the oldest complete ear in which a carved polyethylene implant was used is now seven years old.

Very shortly after the publication of the above article by White, Rubin, and Walden, a similar method used at Walter Reed Hospital for management of the hair line in ear reconstruction was described by Letterman and Harding.[36] This procedure was developed by them without any knowledge of the prior use of a similar operative method. In an editorial note they state that priority for this idea evidently belongs to White, Rubin, and Walden.

A method of partial ear reconstruction for avulsion of the upper portion of the ear in two stages is described by Crikelair.[37] To do this reconstruction he utilized as a pedicled graft skin immediately posterior on the ear where it meets the sulcus and the nonhairy skin anterior to the hair line. This pedicled graft was rolled on itself, and a piece of it was inserted for support. The area from which it was taken was covered with a split-thickness skin graft taken from the buttocks.

In a well-illustrated article, Converse et al.[38] describe their technique for surgical correction of lop ears. They have an ingenious way of tubing the cartilage to give a rounded antihelix. The pear-shaped area on the outer surface of the auricle is outlined on the exposed cartilage, the limits of the area being established by an additional series of perforations with a straight cutting needle. Incisions are made through the cartilage up to but not including the perichondrium which covers the outer aspect of the auricular cartilage. The pear-shaped central segment is folded back and tubed upon itself. When the cartilage in the ears is fairly thick, it requires thinning, which may be done by a wire brush, electrically driven. The partially freed cartilage is then more readily manipulated.

Mouth

Flanagin,[39] from the Department of Plastic Surgery, Medical College of Georgia, introduces a new surgical method for reconstruction of the lip region. The grafts used were free composite grafts of skin, mucosa, and the full complement of intervening tissue from the lower lip transferred to the upper lip. The grafts were taken from the center of the lower lip and measured up to 1 cm. wide at the mucocutaneous junction. Obviously, as Flanagin states, this free graft amounts to a small Abbé flap, which reduces the repair to one operation—even when the columella must be lengthened.

To quote, "Four of these grafts have been done and all have survived. Mild superficial necrosis, at some point, has occurred in all of them. This is purely experimental surgery and a radical approach to the flat lip problem. The margin of safety between success and failure is narrow. However, in my hands, these lip grafts have survived somewhat better than the composite ear grafts that have been placed in nostril defects."

Report of an interesting case of hemangioma affecting the right side of the face, including half of the upper lip and corresponding mucosa, is presented by Reid.[40] After removal of the facial lesion the hemagiomatous mucosa was dissected off the right half of the upper lip. A flap of mucosa was turned down, based below, to a level just beyond the free margin of the upper lip. A complementary mucosal flap was then raised on the inner aspect of the right half of the lower lip, based on its face margin. This flap was turned into the defect on the upper lip, and the hemangioma-

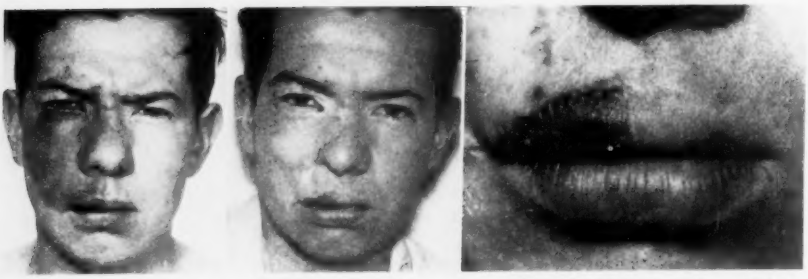

Fig. 5.—Initial condition. (Reproduced with permission from Reid, D. A. C.: Brit. J. Plast. Surg. 9:106-107, 1956, E. & S. Livingstone, Ltd.)

Fig. 6.—After free-graft replacement of involved skin. (Reproduced with permission from Reid, D. A. C.: Brit. J. Plast. Surg. 9:106-107, 1956, E. & S. Livingstone, Ltd.)

Fig. 7.—Mouth showing hemagiomatous mucosa of upper lip. (Reproduced with permission from Reid, D. A. C.: Brit. J. Plast. Surg. 9:106-107, 1956, E. & S. Livingstone, Ltd.)

Fig. 8, *A* and *B*.—The mucosal flap in position. (Reproduced with permission from Reid, D. A. C.: Brit. J. Plast. Surg. 9:106-107, 1956, E. & S. Livingstone, Ltd.)

Fig. 9, *A* and *B*.—Final condition. (Reproduced with permission from Reid, D. A. C.: Brit. J. Plast. Surg. 9:106-107, 1956, E. & S. Livingstone, Ltd.)

tous flap from the upper lip was utilized to cover the raw surface on the inner aspect of the lower lip. The flaps were divided and inset 16 days later, with good result.

A case of giant tongue produced by congenital lymphangioma in a 9-year-old girl is reported by Hendrick.[41] Glossectomy in one stage was carried out, and the deflected

mandible was corrected. The child, two years after operation, has a normal appearance.

As described by Schneider,[42] his operation is designed for those squamous carcinomas of the lower lip which visibly occupy about 0.75 cm. of the lip (in which less than one-half of the lower lip is to be removed). The principle and application of V-resection of the tumor are unchanged; closure is different from that of the usual V-resection.

Probably over a period of centuries V-excision for carcinoma of the lower lip has been done. No original reference, however, was found by Schneider. Much later, as he points out, we come upon the principle of the Z-plasty, which is well known to all plastic surgeons and to most general surgeons. The combining of the two procedures at one operation does not violate the principles of cancer surgery.

Schneider reports one case to illustrate the method and reports that a better than average functional and cosmetic result was obtained.

Cleft Lip and Cleft Palate

Strean and Peer [43] were able to obtain an average of 85% cleft-palate deformities in the offspring of pregnant mice by treating the mother mouse with cortisone from the 11th to the 14th day of her pregnancy. The authors suggest that stress between the 8th and the 12th week of a mother's pregnancy may cause her adrenal gland to excrete an excess of cortisone, which may be a factor in causing some cleft-palate deformities in humans. In later work published in 1957, Peer and his collaborators reduced the incidence of cleft palate in the progeny of mice by administering vitamin B_6 together with cortisone. When folic acid together with cortisone was administered to pregnant mice, the incidence of cleft palate in the offspring was reduced to 20%. Other abnormalities were observed in the cortisone-treated pregnant mice, such as absence of the skull bone with prolapse of the brain, spinal deformities, and kinky tails.

In their article on cleft-lip and cleft-palate cases, Halfond and Ballenger [44] present the audiologic results of a complete audiologic and otorhinologic study of such cases. The hearing losses in two groups of patients were of the mild to moderate conductive type. The significance of the losses medically and in respect to education are discussed.

In his article on cleft lip and cleft palate Coe [45] states that he uses adhesive tape across the protruding prolabium in single and double cleft lips, in infants shortly after birth. He believes that this procedure gives sufficient traction to narrow a complete cleft to about one-third of its relaxed width. During the next week the tape is changed daily with progressive increments in tension until the columella is in the midline. In bilateral clefts the tape is applied first to the prolabium, then to the cheeks drawn forward. Such treatment stimulates the growth of the prolabium, increases the length of the columella, improves the curve of the tip of the affected ala, and narrows the alveolar cleft by simulating the action of the normal musculature. In partial clefts of the lip in which there is a complete cleft of the orbicularis oris, the edges of the cleft may be brought into contact at once. In bilateral clefts, with the usual undeveloped prolabium consistent taping for six to eight weeks will double or triple the size of the prolabium. Coe points out that when an unilateral cleft of the lip is to be closed immediately, taping, of course, is unnecessary.

The value of Le Mesurier's type of unilateral cleft lip repair is again pointed out by Steffensen and Sinclair.[46] Analysis of the cases repaired before 1949 led them to modify their conclusions regarding the nostril repair, with the aim only of establishing a good nostril floor. They no longer repair the nostril at the same time. In minor cleft the nasal deformities become considerably balanced over a period of a few years of

growth without operative interference on the alar cartilages, provided the nostril floors have been made symmetric.

The nostril deformities associated with wide alveolar cleft are more effectively corrected by secondary treatment after a few years of growth. At this time the work can be carried out on an alar cartilage which has greater stability and without the presence of a scarred nasal lining. The time for the secondary adjustment to be done should be considered in each individual case, but to wait until facial growth has become fairly well established would appear to be advisable.

In order to secure "a free upper lip" in the surgical treatment of bilateral cleft lip, von Deilen[47] feels that it is advisable to use a modified method as described originally by Schultz. In this technique the lip lining is formed by turning the vermilion medially and as much of the bordering skin as is necessary to line the lip. One-half of the lining comes from each side. Von Deilen points out that this procedure gives a notched anterior lip but he feels that later with secondary repair a more mobile lip can be obtained.

Fomon et al.[48] discuss the importance of not aiming for a good result primarily in harelip revision. He thinks initial surgery should be limited to the restoration of the elastic pressure of the reconstructed lip, with avoidance of the trauma and sacrifice of tissue necessary to obtain a cosmetic result. He believes a revised concept of new principles in theory is needed. Among questions he asks is, "Why will a surgeon who would unhesitatingly delay a rhinoplasty until the parts have fully developed allow himself to be persuaded into a harelip-nose operation on the infant?"

Fomon describes several methods of repair of nostril deformity, including bone and cartilage grafts, fascia lata slings, the insertion of prosthetic appliances, as well as surgical realignment of the nose.

The problem of the surgical management of nostril deformity in unilateral harelip at the time of primary and secondary repair is considered by Gelbke.[49] He advocates external incisions and suturing wings of nasal cartilage together under direct exposure. This is done in conjunction with the Le Mesurier type of lip repair.

EDITORIAL COMMENT: The photographs illustrate that the author has secured immediate results, but, as pointed out by Steffensen in the above article, should the alar cartilages be tampered with at the time of primary repair?

Cronin[50] thinks that it is a mistake to use any lateral lip skin to lengthen the prolabium. Almost all such lips becoming too long hide the upper teeth completely and are always short from side to side, resulting in a small mouth. The circular scar contracting around the island of prolabial skin often causes it to stand out as a dome above the surface of the rest of the lip.

In Cronin's opinion, cosmetically and functionally the repair of a double cleft lip requires the use of the prolabium to form the full vertical length of the central portion of the lip. He describes his method for closing the double cleft lip with diagrams, and prefers to have bilateral scars in a straight line. This is accomplished by sacrificing the lateral edges of the prolabium.

In contradistinction to many workers, he believes the premaxillary segment should be set back. If, however, bony union of the vomer is obtained, the premaxilla gives adequate support to the lip. He also describes his technique of recession of the premaxilla. Excessive protrusion of the premaxilla is a definite complication to the repair of both the lip and the palate.

Correction of major defects of the palate are discussed by Edgerton and Zovickian.[51] Extrapalatal tissue was used to correct the defect in 11 patients, cervical flaps in 7 patients, and arm flap tissue in 4. A syphilitic perforation was closed with lined mucoperiosteal flaps. Two defects were closed with immediate split-thickness skin grafts. In one patient with cancer in the uvula a pharyngeal flap was applied in

Fig. 10.—A photograph of a skull which shows the lines along which surgical fractures are created in order to facilitate a shift of the right and left maxillae laterally. (Reproduced with permission from Adams, W. M.: Plast. & Reconstruct. Surg. 17:430-437, 1956, The Williams & Wilkins Company.)

immediate reconstructive technique. Heretofore, pharyngeal flaps have been advocated primarily for soft palate insufficiency occurring in congenital palate deformities.

It became apparent to Edgerton and Zovackian, as the series increased, that cervical tissue offers the ideal donor material and can be most readily passed into the oral cavity by the submandibular incision.

Hyslop et al.[52] start the bone flap operation at the age of 9 months. They do not feel that, in the absence of scarring over the broad surface, surgery at this age interferes with the normal development of the maxilla and expansion of the dental arches. In agreement with the opinion prevailing at most clinics throughout this country and England, they believe that if operation on the palate can be completed before the child learns to talk, the opportunity for good speech is at least 80% higher, provided the best anatomic closure of the palate has been done.

EDITORIAL COMMENT: One of us (L. A. P.) has been using this method for many years after observing the results of the late Warren Davis, of Philadelphia.

Adams[53] describes his surgical technique to correct alveolar collapse in some patients with cleft palate. In his surgical technique for this purpose he produces a bilateral complete horizontal fracture of the maxilla

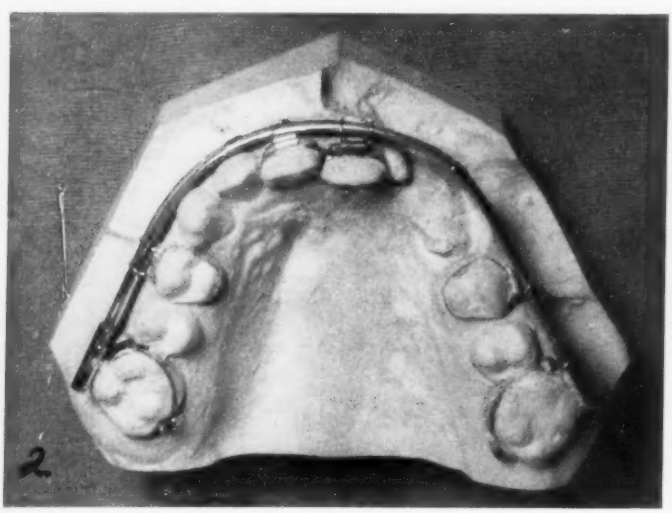

Fig. 11.—The self-retaining orthodontic splint which is made to fit the repositioned segments of the upper arch. (Reproduced with permission from Adams, W. M.: Plast. & Reconstruct. Surg. 17:430-437, 1956, The Williams & Wilkins Company.)

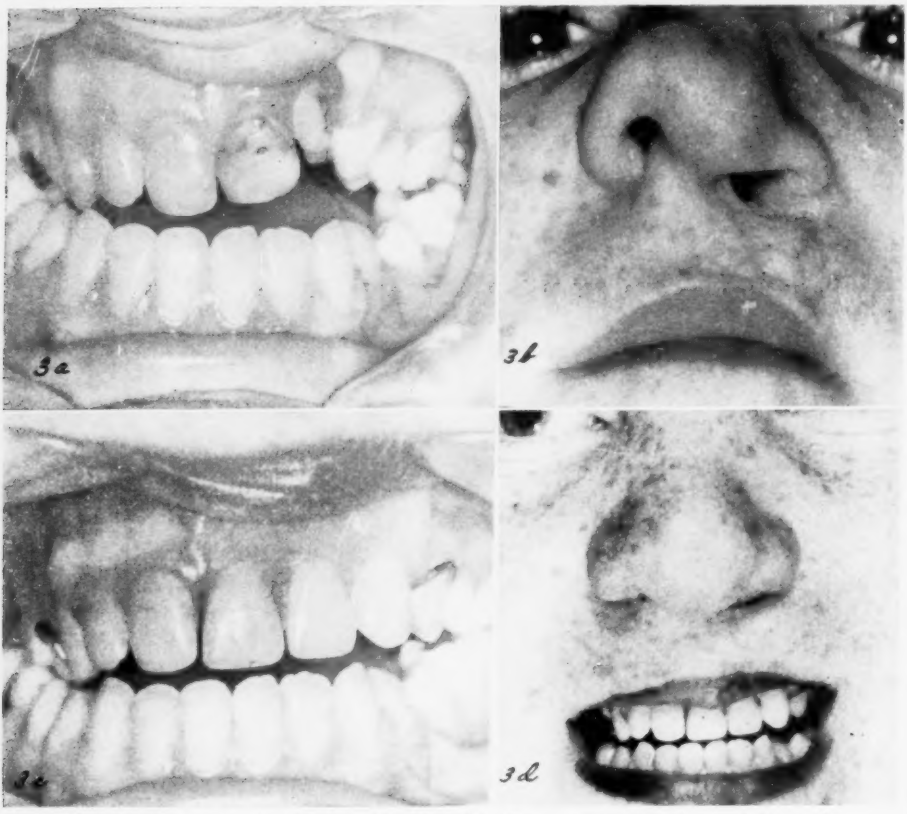

Fig. 12.—The case of a 13-year-old white girl. Top, preoperative views of the patient. There was a collapse and underdevelopment of the palate and narrowing of the upper dental arch. Bottom, postoperative views of the same patient. A prosthetic appliance is in place, and the upper and lower arches occlude properly. (Reproduced with permission from Adams, W. M.: Plast. & Reconstruct. Surg. 17:430-437, 1956, The Williams & Wilkins Company.)

plus a vertical fracture through the site of the old cleft in the hard palate. This permits a shift of the right and left maxilla laterally to any desired position. Fracture expansion of the maxilla is indicated on all patients who fail to show improvement by more conservative methods.

An orthodontic splint is applied at the time of surgery and worn for two or three months. After removal of the orthodontic splint, a permanent prosthesis is inserted to replace any missing teeth, to maintain the proper position of the maxilla, to provide fullness and more normal contour to the upper lip, and to close any cleft of the hard palate.

Champion[54] discusses the different methods of treatment for micrognathia associated with cleft palate. He feels that not any one of these methods should be used in every case. Each method has value but they should not be employed indiscriminately. Champion stresses early repair of the palate as advised by Mitchell-Nelson, and gives two case reports. In one patient repair was carried out at the age of five months; in the second patient palate repair was performed at one month of age.

George Pap,[45] of Bristol, England, advocates simultaneous repair of the nose and lip in secondary correction of unilateral cleft lip. The operation consists of the

following steps: infracture of the bony nasal walls; resecting and shifting of the septum and nasal spine towards the midline; cutting of both alar cartilages and adjustment of their height and shape; repositioning of the alar base and reconstruction of the nostril floor, and secondary repair of the cleft lip. He points out that at the end of the operation there is often a fold of redundant skin bulging into the nostril floor, inside the alar base, and he prefers to correct this at a later stage.

Pharynx, Larynx, and Trachea

In a case report of complete laryngeal stenosis in the subglottic region due to perichondritis from traumatic injury, Erich[56] demonstrates the efficacy of his method of treatment. In cicatricial laryngeal stenosis he surgically excises the thickened scar tissue causing the condition, and subsequently grafts skin on the resulting raw surface, with surgical approach through the midline to the interior of the larynx. The thin-skin graft is wrapped around a sponge rubber mold which fits within the larynx and trachea. Then an acrylic obturator is made to maintain the patency.

In order to obtain the maximal information from radiographic investigation of patients with speech defects, particularly those of obscure origin, Calnan[57] recommends a palatopharyngeal radiographic analysis. Radiographic investigations cannot, and should not, replace the routine physical examination and speech assessment. They may, and frequently do, afford information which cannot be obtained in any other way. Calnan found measurements, graphs, and scales of little benefit in radiography of the face. He describes how palatopharyngeal radiographic analysis should be made, discussing the different factors entering into it and, for treatment he prefers the Kilner V-Y operation. Pharyngoplasty by muscle transplantation in Calnan's hands produces a prominence on the posterior pharyngeal wall, to which the soft palate can elevate and meet.

Conley[58] discusses fistulas in association with pharyngostome and esophagostome in a well-illustrated article, and he advises use of adjacent tissues whenever possible to close a small pharyngeal fistula. However, the availability of neck skin which can be moved safely when a bilateral radical neck dissection has been performed is minimal. Although the acquisition of supplemented skin in the form of a pedicle flap prolongs the morbidity, there is no other satisfactory alternative.

The vast majority of uncomplicated small fistulas heal spontaneously within one to three weeks. The large fistulas associated with radical surgery of the neck are closed in one-stage operation. Large fistulas, in addition to postirradiation ulceration, require the use of transposed neck or chest flaps in single or multiple operations, depending upon the availability of adequate healthy tissue.

The pharyngostome and esophagostome, as stated by Conley, are intentioned surgical maneuvers carried out in the absence of sufficient mucosa to effect immediate closure and are usually associated with extensive resection of the pharynx, larynx, esophagus, and neck.

Subtelny and Baker[59] accumulated specific information concerning the role of adenoid tissue in cleft palate. From their study of a group of children, they concluded that adenoid tissue should not be removed in children with a cleft palate unless medical circumstances absolutely dictate it. After adenoidectomy the velopharyngeal closure is restricted to a limited area, and speech becomes hypernasal.

Esophagus

In 1954 Leahy described the various types of surgical procedures for caustic burns of the esophagus as follows: (1) external esophagus—skin tube and presternal intestinal tube; (2) resection and end-to-end anastomosis; (3) by-passing or replacing the esophagus by an intestinal tube (intra) thoracic, and (4) resection and esophago-

gastrostomy. Hardin[60] points out that skin tubes are not used much now. They do not have peristalsis, and food must be massaged down. In constructing a presternal intestinal tube the jejunum is commonly used. In 10% of the cases in which strictures developed, there was indication for reconstructive surgery.

Connar and his colleagues[61] believe there is need for a palliative procedure rather than esophagogastrostomy in cases of irresectable carcinoma of the esophagus. In experimenting with free autogenous dermal grafts in dogs, they were unsuccessful in anchoring a stent, but they believe this should not be difficult in the human. The thinness of the dog's mediastinal pleura is noted. From the clinical viewpoint, a free autogenous dermal graft could be used around a temporary stent in the reconstruction of the cervical esophagus and hypopharynx in cases of carcinoma.

Jaw

Two cases of severe mandibular deformity are reported by Kazanjian,[62] each originating in childhood. Surgical efforts were directed to reestablish jaw function by arthroplasty and sliding osteotomy. Then contour restoration was accomplished by bone grafting, and finally, intraoral anatomy was made suitable for retention of dentures by skin grafting.

The first case involved unilateral underdevelopment of the horizontal and ascending rami. A fragment on the right in the lower jaw was brought forward and held in position by wiring the two bone ends and joining the entire lower jaw to the upper with intermaxillary wires. Bone was transplanted to the chin and to the sides for improvement of the contour.

The second case was bilateral and was further complicated by temporomandibular ankylosis. The skin grafted area along the buccal alveolar groove allowed for construction of a denture with sufficient bulk to improve the facial contour.

Kazanjian[63] also presents a case of marked retraction of the chin and conspicuous depression on each side of the face with absence of both ascending mandibular rami. In his judgment, experience indicates that one must hesitate to carry out osteoplastic operations for such deformities until the child's second permanent molars have erupted. To transplant a piece of tibial cortical bone to join the mandible and temporal bone and an artificial joint, as he had previously done, was an unnecesary complicated procedure. The stump of the ramus is exposed, in his present procedure: the line of cleavage between the masseter muscle and the internal pterygoid is found, and the base of the skull is located by blunt dissection. A measured piece of bone is then transplanted and the lower end is firmly fastened to the mandibular stump. For contour restoration Kazanjian always prefers autogenous bone grafts rather than preserved cartilage or foreign substances, for one may always utilize the adequate supply of live bone within the body of the patient.

As pointed out by Erich,[64] complete loss of the inferior maxilla presents a deformity that is extremely difficult to repair. He reports one very interesting case in which the chin loss was replaced with a clavicular tube flap. This was lined with a Thiersch skin graft, and an intraoral acrylic prosthesis was used to simulate a chin.

Genest,[65] of Montreal, Canada, presents six case reports in which he stresses the quality of vitallium in jaw replacement. He thinks that vitallium is well suited for mandibular reconstruction. In a personal communication to one of us (J. C. W.) he stated that denture over vitallium has not been successful, but the patients in respect to functional and cosmetic results have been able to carry on a fairly normal life.

In a two-stage technique for restoring lost mandibular bone, Smith and Robinson[66] use individually designed and constructed stainless steel bone onlay splints. By this technique infection and inadequate

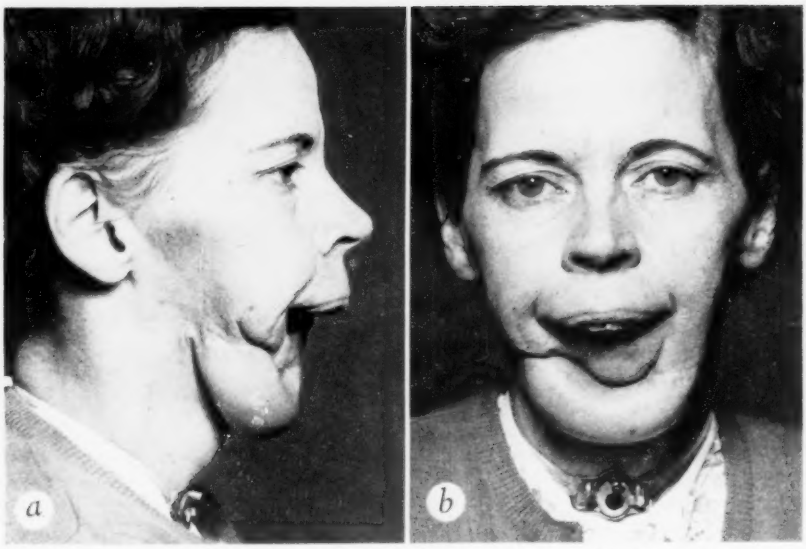

Fig. 13.—Clavicular tubed flap of skin attached to either side of chin. The tube later was inlaid in a horizontal direction between the chin and the floor of the mouth, thereby bringing in a bulk of soft tissue to hold the lower lip and chin forward. (*a*) Side view. (*b*) Front view. (Reproduced with permission from Erich, J. B.: Plast. & Reconstruct. Surg. 18:191-198, 1956, The Williams & Wilkins Company.)

immobilizaton are minimized. From accurate study models and caliper measurements of the patient's jaw a plaster mandible is constructed to simulate the feature. At primary operation an acrylic insert is used temporarily to replace the lost mandibular bone, allowing the soft tissue to heal about the splint. This splint is left in situ for 10 months, when at a second-stage operation it is replaced with an autogenous bone graft.

Rehrmann,[67] of Düsseldorf, Germany, discusses mandibular reconstruction. A method of preparation of the wound bed in patients requiring restoration of the ramus mandibulae is described. This procedure helps to avoid lesions of the facial nerve and of large vessels. It consists in proceeding from the diagastric tendon along the lateral surface of the stylohyoid muscle and styloid process into the glenoid fossa by blunt dissection.

He presents two cases in which he has used autogenous bone grafts to correct this defect, with excellent results according to the illustrations.

This article on surgery of the mandible by Sarnat and Robinson[68] covers the subject completely and comprehensively, and any one interested in jaw surgery should read it in its entirety.

As pointed out, any interference which will affect the growth center of the mandible will alter the orderly progression of development and will result in some type of mandibular deformity. Therefore an understanding of normal growth of the mandible forms the basis for early recognition and proper surgical treatment of some deformities.

Gonzalles-Ulloa[69] reports on a follow-up of a case of prognathism repaired by double condylectomy, published in 1951 and 1952. In the course of five years since then a number of new cases have occurred, and the results of the operation are presented, that is, the functional, esthetic, and psychological condition of this group of patients.

Gonzalles-Ulloa still likes to do the operation, and, according to the illustrations, his results have been good. It is certainly

Fig. 14.—Patient with prosthesis in position, showing fairly normal facial contour. (*a*) Front view. (*b*) Side view. Some of the redundant fat in the transplanted tissues back of the chin will be removed later on. (Reproduced with permission from Erich, J. B.: Plast. & Reconstruct. Surg. 18:191-198, 1956, The Williams & Wilkins Company.)

a simplified method, and it would be interesting to have other reports on its use.

Fractures

Adams and Adams[70] from Memphis, Tenn., report on a follow-up of patients on whom they employed internal wire fixation for facial fractures over a period of 15 years, and they reemphasize the importance and simplicity of the procedure, with diagrammatic illustrations. They give the locations and method of fixation wiring of the commonest fractures of the face. Their particular interest is their manner of reduction and immobilization of fractures of the maxilla with associated fractures of the zygoma or malar process.

Also in reference to fractures of the facial bones, Walden et al.[71] report all cases in which the patients were treated at King's County Hospital over a five-year period from 1950 through 1954. Their philosophy in the treatment of facial fractures has been to use the simplest techniques to give the best results. They found that patients with direct bone wiring can be discharged much earlier than those with external splints, and they can shave and keep clean much more readily than those patients who have head caps or external splints. Thus, less danger of infection exists. In agreement with Adams and Adams, Walden and his associates believe that available open surgical methods give much more accurate reductions than external skeletal fixation methods.

The commoner injuries due to traumatic fractures of the facial bones are discussed by Stokes,[72] with serious complication of the visual apparatus, nerve injury, respiratory obstruction, restriction of mandibular motion, and vascular injury, together with the less common complications. He emphasizes need for careful clinical and radiographic evaluation of the patient and proper selection of a method of treatment and the need for reevaluating its effectiveness before the bone "set" and while conditions are still favorable for further modification and correction.

According to Heslop,[73] the combination of fracture of the midline of the mandible, with dislocation of one condyle from the glenoid fossa, without an associated fracture of the condylar neck or the adjacent ascending ramus, appears to be extremely uncommon. No record was found in the literature of such a case and it does not

fit into the usual classification of fractures and fracture dislocations of the mandible. In Heslop's procedure, intermaxillary tie wires were loosely placed; the mandibular fragments were reduced, and the interosseous wires were tightened. Immobilization was completed by twisting up and securing the intermaxillary wires, which brought the teeth into occlusion.

As stated by MacLennan,[74] the lower jaw increases mainly in the anteroposterior dimension between the ages of 6 months and 5 years. In application of this fact it is possible to prefabricate a simple Gunning-type splint in acrylic resin and line it with black gutta-percha to allow for minor discrepancies in alveolar contour and teeth. If the gutta-percha is thinned in the area which is directly over the crowns of the teeth, the fragments of the mandible can be reduced into the splint and circumferential wires affixed to control and immobilize the fragments in the reduced position. The anteroposterior dimensions of the splint can be adjusted where necessary to suit each child. The aim should be for the splint with the gutta-percha lining to extend back to the retromolar region on each side. The obvious advantage of such an appliance lies in the fact that the patient is subjected to one surgical intervention, with reduction of the fracture, insertion of splint, and final fixation.

After pointing out deterrents to the open reduction of subcondylar fractures Rongetti and DeAmesti[75] present a procedure in which the incision, almost a complete half circle, is made through the ear to perform reduction. This endaural approach is comparatively simple, safe, and involves no scarring. The incision, through which interosseous wiring is feasible, is inconspicuous.

Gibson and Allan[76] designed a wire suture of hard steel or malleable stainless steel for internal interosseous fixation of mandibular fractures. The fracture is exposed through a submandibular incision, and holes are drilled in each fragment near the lower border of the mandible and close to the fracture line. One of prepared eyelets is passed through each hole from without inward. The sharpened end of piano wire is pressed through the skin just behind the angle of the mandible so that the wire comes to lie on the lingual aspect of the bone, then passes through each eyelet so that it projects beyond them. The eyelet wires are twisted tight, and the twisted ends of the eyelets are brought out through a separate small stab wound below the main incision.

For fracture-dislocation of the malar compound Martin and his associates[77] prefer the transantral approach. The Gillies' procedure is the simplest and most efficacious for elevation of depressed fractures of the zygomatic arch in the absence of a laceration over the fracture site. Chronic maxillary sinusitis may occur following the transantral reduction of fracture-dislocation of the malar compound, but the chance of its occurring is greatly reduced by adequate drainage through a nasoantral window formed at the time of surgery. Bone and cartilage grafts can be used to correct any persistent facial deformity.

Tumors

Five hundred consecutive case records of 6479 cases form the basis of the detailed study of hemangiomas in infancy and childhood by MacCollum and Martin[78] at the Children's Medical Center of Boston. If there is a period of rapid growth of the lesion, the question of malignancy must be considered; all lesions from which biopsies were taken subsequently proved to lead a benign course. The first indication of possible regression is the establishment of a stationary period in the growth of the tumor. The innate peculiarities of any particular lesion must be thoroughly understood before deciding on therapy. Any lesion showing a rate of growth greater than over-all growth of the child or a lesion of permanent nature indicates therapy. Specific methods of treatment for

various types of hemangiomas are discussed.

Since 1946 Utendorfer [79] has employed total parotidectomy in the treatment of mixed tumors and during this period he has carried out the procedure on 23 patients. The average length of follow-up was 33 months, and there were no recurrences in the series.

Daughter tumors and extracapsular penetration are removed by total parotidectomy, whereas they may be allowed to remain when extracapsular dissection is done. No permanent complete facial paralysis occurred. Slight nondisfiguring weakness of a portion of the mandibular division, temporary weakness of one or more of the divisions of the nerve, and sweating of the cheek on the side operated on were noted in some patients. The cosmetic result has been excellent.

Edgerton and DesPrez [80] report their experiences with four cases of lethal midline granuloma of the face. The symptoms, diagnosis, the physiopathology and clinical course of patients with this lesion are discussed. Edgerton and DesPrez emphasize the chronicity and the difficulty encountered in attempts at reconstruction during quiescent periods of the process. In one patient an Abbé flap from healthy tissue of the patient's lower lip seemed to resist the advancement of the disease. Treatment by adequate surgical débridement, supportive measures, and possibly cortisone has offered encouraging results in altering the prognosis.

A survey of 56 cases of suspected external ear malignancy is presented by Fredricks.[81] Fifty-four were subsequently proved to be carcinomata. These cancers are successfully being treated by both surgical and radiotherapeutic methods. He discusses the various types of malignancies and their clinical course as well as the surgical treatment. Lesions confined to certain portions of the ears, as the helix, the central region, and the pinna are considered and illustrative cases are reported. The cases covering a period from 1946 to 1954 have been observed for at least a two-year period following surgery. Fredricks emphasizes the importance of accurate preoperative diagnosis and examination and the possibility of multiple primary skin cancer.

Five-year end-results for a consecutive series of patients treated at the Roswell Park Memorial Institute for epidermoid carcinoma of the lower lip are presented by Backus and DeFelice.[82] They prefer surgical excision of the lip lesion. There is general agreement that neck dissection is the treatment of choice when palpably demonstrable cervical metastases are present. Backus and DeFelice conclude that epidermoid carcinoma of the lip exhibits certain biological characteristics which justify treatment of cervical nodes by dissection therapeutically rather than prophylactically, provided there is adequate follow-up of patients.

A report on a series of 280 cases of carcinoma of the lip is presented by Clifton and Hardin [83] for statistical analysis. Radiation and surgery seem to give about the same results in the treatment of uncomplicated carcinoma of the lip. In their opinion, there is a definite relationship between the size of the lesion and the five-year survival rate. The lesions in the series were predominately Grade 1 and 2 squamous-cell carcinoma.

Clifton and Hardin,[84] in a second article, analyze 223 cases of intraoral cancer treated at the Confederate Memorial Medical Center in the last 23 years. The incidence of metastasis varied in the following order of decreasing frequency: tonsil, tongue, floor of mouth, lower gum, buccal mucosa, palate, and upper gum. This order of frequency does not hold true for the per cent of metastasis which was bilateral. The size of the lesion was found to be highly significant in the five-year survival rate. When the lesion is more than 2 cm., the prognosis is much graver. The fact that many local recurrences do occur at sites

unexplained by metastatic routes proves to Clifton and Hardin that seeding can and does occur during surgery.

Orton's[85] report on carcinoma of the larynx is based upon a series of 441 cases in which operation was performed. The operative mortality within three weeks of operation was less than 1.3%, not including 78 neck dissections. He suggests the following classification: (1) true cordal cancer, and (2) the anatomical site, which would designate the true origin of the growth, as in the epiglottis, ventricle, aryepiglottic fold, arytenoid, piriform sinus, and below the glottis.

Orton believed that the time between the onset of hoarseness and the inception of definite care would be shortened if adequate examination is substituted for inapplicable therapeutic measures. The best time to treat extensive carcinoma of the larynx is at the first operation. The areas of lymphatic drainage should be blocked off from the general system. The combined operation affords a better chance of cure than if the surgeon waits for clinical evidence of metastasis.

According to Kostrubala,[86] two types of carcinoma of the palate are recognized: primary carcinoma of the squamous epithelial type, and secondary carcinoma, commonly from the original lesion of the alveolar process. Of much greater importance are the secondary lesions involving the palate but originating either in the floor of the nasal cavity or in the maxillary sinus. Secondary malignant tumors may involve the palate by medial extension from the gums, pharynx, and tonsils. Adenocarcinoma of the palate is believed to originate either in the minor salivary or in the mucous glands. The mixed tumors arise in the minor salivary glands of the palate and are covered with normal mucosa. Some of these tumors though benign may undergo malignant degeneration.

According to Havens and Ye,[87] in the period 1919 to 1952 inclusive only seven cases of primary malignant tumors of the uvula were observed at the Mayo Clinic. The incidence of such lesions is very rare, which is evident from the fact that during this period some 1,500,000 patients were admitted to the clinic for examination. The lesion may appear as an ulcer, or the uvula may have a granular appearance and look as if it were indurated and stiff rather than flabby as the normal uvula is. Havens and Ye believe that excision of the local lesion, preferably with the electrocoagulating unit, is the best method of treatment.

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HEARING LEVEL, HEARING LOSS, AND THRESHOLD SHIFT

To the Editor: The following excerpt from our recent paper in the *A.M.A. Archives of Industrial Health* entitled, "The Medical Principles of Monitoring Audiometry" (Davis, H.; Hoople, G., and Parrack, H. O.: *A.M.A. Arch. Indust. Health* 17:1-20, 1958), speaks for itself.

"*Hearing Level, Hearing Loss, and Threshold Shift.*—The familiar term 'hearing loss' includes three quite distinct concepts, and much confusion and many unnecessary arguments have occurred in court rooms, in committee rooms and in clinics because of this semantic monstrosity. These three concepts are (1) the otological meaning—*symptom* indicating an *abnormal condition* of hearing, (2) the audiological meaning: the *status of hearing* as measured by a reading in decibels on the hearing-loss dial of an audiometer, and (3) the common sense meaning—*a change for the worse* in the sensitivity of hearing. It has been particularly difficult in medicolegal situations to reconcile the second meaning with the other two and to explain that the normal range of hearing extends from a hearing loss of −10 to a hearing loss of +10 or +15 db. It is hard to convince a jury that a man can have a hearing *loss* of 10 db. when his hearing may actually never have *changed* at all. It has been very difficult and cumbersome, also, in our own writing to distinguish clearly between the *status* of hearing, to which disability of hearing and physical standards for military duty, etc., are related, and a *change in status* of hearing, which is the central concept of monitoring audiometry.

"We shall use and we recommend for general usage, three different terms for three different although related meanings of 'hearing loss.'

"1. '*Hearing level*' is the deviation in decibels of an individual's threshold of hearing from the American Standard value for the reference zero for audiometers. This is a measure of the *status of hearing*. It is read directly on the 'hearing loss' scale of an audiometer. To be completely explicit we should say 'threshold hearing level,' meaning 'the number of decibels above the sound-pressure level that corresponds to the reference threshold of hearing.' In general, however, the shorter phrase 'hearing level' should be adequate.

"The military physical standards of acceptable hearing and some of the 'monitor limits' that are to be described later are now stated in terms of 'hearing loss,' but in accordance with the new usage here proposed they should be stated in terms of 'hearing level.'

"'Hearing level' refers to a single measurement made with a standardized instrument and referred to an arbitrary zero reference level. Larger numbers indicate that more acoustic energy is needed to reach the threshold of hearing. The term is analogous to the physicist's 'sound pressure level.' Both specify a level relative to a reference level, but the reference for hearing level is different at different frequencies.

"The term '*speech hearing level*' or 'hearing level for speech' is a convenient designation for the average of the hearing levels for the frequencies necessary for the understanding of speech.

"2. '*Hearing loss*' will only be used to refer to the *symptom* of reduced auditory sensitivity, as in the phrases 'conductive hearing loss,' 'noise-induced hearing loss,' etc. These examples illustrate the otologist's automatic concern with the question of the mechanism of a hearing loss, its cause, and its possible cure. 'Hearing loss' for the otologist is the modern substitute for the old phrase 'partial deafness' and means almost exactly the same thing as 'auditory impairment.' It may also be used in a general way to refer to the *process* of losing auditory sensitivity, as in the phrase, 'he suffered a hearing loss.'

"3. A '*threshold shift*' is the deviation in decibels from an individual's own previously established reference audiogram. It is a *measure of change in the status of hearing*. It is the term we shall usually employ instead of the more familiar 'loss of hearing.' Unless otherwise specified it is assumed that the shift of threshold is upward to a higher hearing level.

meaning that the change in hearing is a change for the worse. A change for the better will usually be termed a 'recovery.'

"It is very useful to distinguish 'temporary threshold shift' from 'persistent threshold shift.'"

We particularly recommend to the readers of *Archives of Otolaryngology* the use of the term, "hearing level."

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News and Comment

ANNOUNCEMENTS

Institute on Industrial Deafness.—Colby College, Waterville, Maine, presents the Sixth Annual Institute on Industrial Deafness, Aug. 11-20 inclusive. Attention is called to the fact that the course has been extended for three days in order to include engineering for noise control. The objective will be to train physicians interested in the problem, nurses, plant engineers, and others in initiating and conducting hearing conservation programs in noisy industries. The course includes basic otology, audiometry, noise measurement, ear protection, and methods of noise control. The class is limited to approximately 20 participants. Dr. Frederick T. Hill is director and Dr. Joseph Sataloff, associate director.

The fee for the course is $250 and includes tuition, room, and board. The first week will constitute a complete course for doctors and nurses, and the reduced fee for it will be $200. Application should be made to Mr. William A. Macomber, Colby College, Waterville, Maine.

Abstracts from Current Literature

Ear

Use of Biomydrin Otic—An Antibiotic Solution—In Otic Infections. Robert E. Votaw, Eye, Ear, Nose & Throat Month. 36:410 (July) 1957.

Biomydrin otic contains two antibiotics, a corticosteroid, and antihistaminic, and a mucolytic agent. The antibiotics used, neomycin and gramicidin, are nonsensitizing because they are primarily restricted to local use, and are effective over a broad spectrum.

A total of 126 patients were treated; the largest group, 92 patients, had otitis externa. A large precentage of these patients responded favorably to this treatment. The preparation was also found useful as an effective prophylactic agent in the swimming season in patients who had previously experienced repeated external-ear infections. The solution was effective in some cases of acute and chronic otitis media as well as in the preoperative preparation of patients with chronic mastoiditis with foul discharge and aural polyps. It was also found useful in promoting quicker healing in radical mastoidectomy cavities.

Jennes, Waterbury, Conn.

Treatment of Otitis Externa with Terra-Cotril Suspension. John R. Ausband, Eye, Ear, Nose & Throat Month. 36:463 (Aug.) 1957.

A preparation containing 0.5% oxytetracycline and 1.5% hydrocortisone was used in treating 22 patients with otitis externa. In each case a culture was taken prior to treatment. Therapy consisted of 2 drops of the suspension in the involved ear three times a day. In terms of relief of pain, swelling, and pruritis, excellent results were obtained in 68% of the ears treated, good results in 13%, improvement in 13%, whereas in 6% there was no improvement. Therapy was continued for at least five days in every case, and the average duration of therapy was 7 to 10 days. There were no evidences of allergic sensitivity to the preparation and no side-effects were observed.

Jennes, Waterbury, Conn.

Hearing Evaluation in Industry. Aram Glorig, Eye, Ear, Nose & Throat Month. 36:519 (Sept.) 1957.

Industry must direct its attention to the problems resulting from the increase in the number of people exposed to noise in industry, and from the increases in the noise level. Programs must be developed to aid in the prevention of hearing loss from this excessive noise exposure. In such programs, the measurement of hearing is of utmost importance and this should include preemployment testing and periodic follow-up tests. These tests should be air-conduction threshold measurements.

The preplacement tests provide an auditory baseline to be used for reference purposes during the period of employment or for establishing the hearing status for compensation purposes. A period of 16 hours should elapse since a worker's last noise exposure before he has preplacement tests. This will exclude temporary loss due to noise exposure immediately preceding the examination.

Routine follow-up tests must be performed on persons working in areas where the noise level exceeds 85 db. at the 300 to 600 and 600 to 1200 bands. The first follow-up test should be given approximately 90 days after placement, but not within 16 hours of exposure to noise. If any change noted in the first follow-up audiogram is less than 15 db., it is sufficient to do subsequent tests at approximately yearly intervals unless subsequent symptoms cause a change in the situation. If there is a shift of 15 db. or more in the direction of increased hearing loss at one or more of the frequencies tested (500 to 6000 cycles), appropriate steps should be taken to conserve the worker's hearing.

It is possible to make a gross check on changes of hearing from single frequency screening tests using 4000 cycles as the frequency. When the loss at 4000 cycles is however, greater than 50 db., this frequency does not accurately reflect the change at other frequencies and a threshold test should be performed.

When there have been changes in the auditory threshold sufficient to necessitate reassignment of the employees in order to conserve hearing, a series of three threshold audiograms should first be made under similar testing conditions, but on different days. The three audiograms must agree within 10 db. at four or more of the audiometric frequencies in order to be considered consistent. The audiogram that gives the lowest average of the values at 500, 1000, and 2000 cps should then be used as the basis for reassignment. If the three recheck audiograms are not consistent, the worker should be referred to a physician. Although it is not necessary that the testing be performed by a physician, it is essential that medical supervision be available to industrial hearing conservation programs.

JENNES, Waterbury, Conn.

MICRONIZED CHLORAMPHENICOL POWDER IN DISEASES OF THE EAR. JOSEPH FREEMAN, Eye, Ear, Nose & Throat Month. 36:528 (Sept.) 1957.

Micronized chloramphenicol powder delivered through a powder blower was used in the treatment of 54 patients with clinically apparent Gram-negative aural infections. These included otitis externa, otitis media, both acute and chronic, and infected mastoid cavities. Of the 54 cases treated, in 48 the ears became dry, and in 6 the ears were improved. The number of daily treatments for each patient averaged two to three.

It is essential that the pure micronized chloramphenicol powder be utilized, as results with both the contents of a standard 250 mg. Kapseal and with nonmicronized crystalline chloramphenicol have not been so satisfactory. In cases of diffuse external otitis with closure of the meatus by edema, a meatal wick is inserted and saturated by wet compresses of chloramphenicol solution, and chloramphenicol in full dosage is used orally.

JENNES, Waterbury, Conn.

REHABILITATION OF THE HARD OF HEARING. ALAN AUSTIN SCHEER, Eye, Ear, Nose & Throat Month. 36:593 (Oct.) 1957.

After a preliminary discussion of the general subject of rehabilitation in deafness due to both conductive and perceptive causes, the author restricts his remarks to the surgical treatment of otosclerosis. Mobilization of the stapes is advised as a primary procedure, first in one ear, and possibly in the other. He advises fenestration only if surgical mobilization has not been successful.

With the original technique of mobilization it was possible to mobilize successfully one out of three cases. Since the rapid development of mobilization of the stapes it is now possible to mobilize successfully two out of three cases. The author presently follows a technique consisting of three steps. These steps should be followed routinely in the stated order in each case, and only when the first step is unsuccessful should the second be used, and, similarly, if the second step is unsuccessful, the third step is used.

Step 1 consists of transincudal pressure to the stapes by application of pulsating pressure with a curved pick into the end of the long process of the incus. If there is no sign of loosening of the stapes, then Step 2 is utilized, in which there is direct application of pressure to the head of the stapes. This pressure is directed toward the posterior crus. If the stapes has still resisted mobilization, Step 3 is followed. This consists of a direct approach to the footplate of the stapes, and requires the use of the operating microscope in order to obtain adequate visibility. Simply opening the center of the footplate and leaving the crura fixed is not advisable as the newly made fenestra closes with return of the hearing loss in approximately half of the cases within one week postoperatively. It is necessary to mobilize the footplate of the stapes.

If surgical mobilization is not successful, it is possible to do a fenestration operation with the same possibility of obtaining good results as if no previous operation had been done on the ear. The patient should be prepared beforehand for the possibility of failures and advised and reassured of the availability of methods of rehabilitation, which the surgeon is prepared to try in recommended steps. The patient should therefore not be discouraged by the failure of any one of the surgical steps.

JENNES, Waterbury, Conn.

PROBLEMS IN MILITARY AUDIOMETRY: A CHABA SYMPOSIUM: 3. DIAGNOSTIC AUDIOMETRY. GORDON HOOPLE, J. Speech & Hearing Disorders 22:734 (Dec.) 1957.

The author urges complete audiological evaluations of veterans when the military is assessing hearing loss.

PALMER, Wichita, Kan.

PROBLEMS IN MILITARY AUDIOMETRY: A CHABA SYMPOSIUM: 4. A CLASSIFICATION OF HEARING TESTS. IRA J. HIRSH, J. Speech & Hearing Disorders *22*:736 (Dec.) 1957.

Military audiometrics should probably serve four purposes: 1. to select or reject men on induction; 2. to provide otological information on the state, probable cause, and progress of a hearing loss; 3. to provide information that can be used in establishing the amount of hearing loss for compensations; 4. to enable personnel officers to determine whether or not persons are qualified for military specialties that involve special kinds of hearing ability. Not all hearing tests will suit all the purposes equally well.

PALMER, Wichita, Kan.

PROBLEMS IN MILITARY AUDIOMETRY: A CHABA SYMPOSIUM: 5. REVIEW OF THE REPORT BY THE WORKING GROUP ON MILITARY AUDIOMETRY. RAYMOND CARHART, J. Speech & Hearing Disorders *22*:744 (Dec.) 1957.

In reviewing a number of questions presented by the three Armed Services it was concluded that while individual problems might appear to be different because of differences in internal structure, problems are basically the same in terms of research and general physical testing. Four steps are suggested for improving audiometry in the services: selecting most appropriate tests; establishing standard test procedures; providing standard equipment and adequate test rooms; setting up military specialty number for personnel. Most effective test recommended would be screening-type test similar to one developed by Dr. A. Glorig. An experiment in group audiometry is recommended for the services.

PALMER, Wichita, Kan.

PROBLEMS IN MILITARY AUDIOMETRY: A CHABA SYMPOSIUM: 7. PRACTICAL LIMITATIONS IN MILITARY AUDIOMETRY. ARAM GLORIG (Subcommittee on Noise in Industry, Los Angeles, Calif.), J. Speech & Hearing Disorders *22*:750 (Dec.) 1957.

Personnel, equipment, and test environment are the most important limitations in military audiometry. These could best be offset by establishing military specialty numbers for audiologists and audiometrists. Central maintenance laboratories staffed by civil service personnel and monitored by consultants should be established. Standard plans should be devised to cover the construction of sound-treated test rooms.

PALMER, Wichita, Kan.

PROBLEMS IN MILITARY AUDIOMETRY A CHABA SYMPOSIUM: 8. AUDIOMETRY IN THE ARMED FORCES. CHABA COUNCIL, J. Speech & Hearing Disorders *22*:752 (Dec.) 1957.

Audiometry in the Armed Forces was prepared by the CHABA Council as an official statement concerning the status of audiometry in the military services in 1955. Pure-tone audiometry is recommended by the Council, by some rapid means so that the hearing can be checked easily or monitored. Monitoring audiometry is the new term introduced to designate this intermediate form, which is more elaborate than screening but less elaborate than diagnostic audiometry. After certain basic decisions are reached by the services regarding audiometric standards that their personnel must meet, specifications can then be developed for experimental monitoring audiometers.

PALMER, Wichita, Kan.

SOME RELATIONS BETWEEN AUDITORY FUNCTION AND INTRACRANIAL LESIONS WITH PARTICULAR REFERENCE TO LESIONS OF THE CEREBELLOPONTINE ANGLE. ALLAN C. GOODMAN, Laryngoscope 67:987 (Oct.) 1957.

This is an article very well worth reading, showing the relation of certain audiologic findings to possible intracranial lesions, and the differentiation of these from cochlear lesions.

The results are based on the findings on 18 proved cases of intracranial lesions. Most are angle or brain-stem tumors, but several are supratentorial. The cochlear lesion cases are Ménière's syndrome. These are really used as controls.

The particular audiological tests compared are pure-tone thresholds, spondaic word test, discrimination tests, and recruitment.

The following are the conclusions: 1. In cochlear disorders the discrimination loss is related to the threshold loss for pure tones, but in intracranial lesions the discrimination loss (severe) is not so related. 2. Recruitment is present in Ménière's syndrome (cochlear), but not neces-

sarily absent in intracranial lesions. 3. Diplacusis occurs roughly in half of both cochlear and intracranial disease.

If the lesion is supratentorial, the opposite ear is affected; if subtentorial or brain stem, the same ear.

HITSCHLER, Philadelphia.

OCCUPATIONAL HEARING LOSS. MEYER S. FOX, Laryngoscope 67:1011 (Oct.) 1957.

The importance of occupational hearing loss is just beginning to be appreciated. The loss is the nerve type. Its cause can be one or a few loud blasts or exposure over a long period to slighter noise. Other forms of hearing loss must be eliminated in making the diagnosis. The medical-legal aspects of this problem are discussed. Wisconsin has passed specific legislation dealing with hearing loss resulting from industrial noise. The method used there for determining compensable loss is shown.

HITSCHLER, Philadelphia.

AN EVALUATION OF TWO CLINICAL METHODS USED IN DETERMINING THE PRESENCE OF THE RECRUITMENT OF LOUDNESS PHENOMENON. BARRY S. ELPREN and AUBREY EPSTEIN, Laryngoscope 67:1208 (Nov.) 1957.

Recruitment tests in general are used to determine nonconductive from conductive lesions, recruitment being present in nonconductive lesions. Difference limen (DL) tests have been introduced for measuring recruitment. There are two general types of these: the amplitude modulation and the two-tone tests. The authors feel that these tests as presently conducted are unreliable. They examine two amplitude modulation tests (Jerger, Lüscher, and Zwislocki) critically to see if they can be conducted practically clinically with reasonable accuracy. Their methods and technique are described. Both normal and pathological subjects are employed. Their results indicate that diagnosis made from these tests would be *incorrect* in far too great a percentage of cases for either test to be of clinical value.

HITSCHLER, Philadelphia.

PLASTIC MIDDLE EAR OPERATIONS WITH PARTICULAR ATTENTION TO THE CAVUM MINOR TECHNIQUE. NILS G. RICHTNÉR, Acta oto-laryng. 48:302 (Oct.) 1957.

This report covers 100 tympanoplasties performed in the past two years. These may be described as radical operations on the cell system of the ear combined with thorough inspection of the middle ear and plastic repair of perforations of the membrana tympani *or* formation of a small cavity above the hypotympanum to screen off the round window. Included is the concept of air being able to enter the new cavity. This is known as the cavum minor technique. As a rule the patients operated on had marked impairment of hearing. Average hearing loss before surgery was 55 db.

The cases involved the following: (1) clean radical operative cavities and impaired hearing; (2) discharging ears with marked hearing loss treated by radical surgery; (3) cases with chronic purulent otitis and marginal drum perforations; (4) patients with central perforations and chronic otitis with dry or suppurating ears; (5) cases of adhesive otitis with collapsed and scarred ear drums.

Of 17 cases, 53% were improved 12 to 18 months after surgery; 49% 1 to 4 months, and 48% 5 to 9 months after surgery.

LEWY, Chicago.

AUTOGENOUS FAT IMPLANTS IN RADICAL MASTOID SURGERY. E. BERINI GIMENEZ, Acta oto-rino-laring. ibero-amer. 8:620, 1957.

The author discusses his results in the use of an autogenous fat implant in 35 cases of radical mastoidectomies. After exenterating the mastoid cavity, he inserts the implant, covering the entire cavity. The incision is sutured, and a rubber tube is inserted in the external canal to prevent stenosis, facilitate drainage, and permit the instillation of antibiotics into the mastoid cavity. The postoperative period is usually 15 days. This is painless, fast healing; there is excellent tolerance to the graft, and it results in a regular smooth cavity after the resorption of the fat.

PERSKY, Philadelphia.

THE REMOVAL OF THE FOOTPLATE OF THE STAPES IN CASES OF FAILURE OF MOBILIZATION. H. GUILLON, Ann. oto-laryng. 74:612 (Sept.) 1957.

The author describes a new technique to supplement the mobilization operation. This is a suggested modification in cases where it has not been possible to mobilize the stapes. An

incision is made in the external canal which is extended up to the helix. A flap is then elevated from the superior and posterior walls of the bony canal. The posterior-superior angle of the canal is removed for 2 to 3 mm. exposing the region of the oval window. If mobilization is unsuccessful, the stapes with its branches is removed. The incus is also removed. The mucosa around the oval window is elevated for a few millimeters to facilitate the adherence of the flap. A fine hook is inserted in the posterior pole of the footplate and this is completely removed. The mucocutaneous flap is then placed over the oval window, but does not cover the round window. A variation in the flap can be effected by cutting the neck of the malleus, and so permitting a covering of the attic.

PERSKY, Philadelphia.

THE DESTRUCTION OF THE VESTIBULAR APPARATUS BY ULTRASONIC RADIATIONS IN MÉNIÈRE'S DISEASE MICHEL ARSLAN, J. franc. oto-rhino-laryng. 6:833 (Oct.) 1957.

The action of ultrasonic radiations on living tissue is three-fold: (*a*) mechanical or vibratory action, (*b*) thermic, and (*c*) physiochemical action. As a result of animal experiments, the author offers the following hypotheses: Ultrasonic radiations destroy the neuro-epithelium of the crests of the ampulla and the otolithic macula. 2. The radiations have a favorable action on the hydrops of the endolymph. To effect a destruction of the labyrinth the applicator must be applied directly on the bony lateral semicircular canal; it should be long and thin; it should have an absolute protection from the lateral walls.

The procedure is as follows: A simple mastoidectomy with an exposure of the lateral semicircular canal is performed. 2. The tip of the ultrasonic applicator is applied directly on the convexity of the lateral semicircular canal. Care must be taken that there is neither air nor fluid between the applicator and the bony wall, and that the radiations are directed only to the vestibular apparatus and not toward the facial canal or the cochlea. 3. Constant observation of the nystagmus must be maintained—direction, intensity, form—It should appear from 30-60 seconds after the beginning of the irradiation and disappear after 7-10 minutes. The applicator is then directed to the vertical canals. The nystagmus produced from this position lasts from 5-10 minutes. The procedure is again repeated to determine whether a complete destruction of the labyrinth has occurred. The total radiation should be from 25 to 30 minutes. The intensity of the radiations are usually 9-10 watts per cubic centimeter, and, if the responses are slow, it may be increased to 12-15 watts per cubic centimeter.

In a series of 265 cases treated by this modality, 5 had to have the procedure repeated, and 3 other cases were bilateral. The results were classified as to (*a*) vertigo, first series of 195 cases—184 cures; second series of 70 cases—67 cures; (*b*) hearing acuity—improved in 40% of the cases, and although there was no improvement in the others, there was no aggravation in any cases due to the irradiation; (*c*) tinnitus—improved in 60%-70% of the cases.

PERSKY, Philadelphia.

THE USE OF THE TOCOPHEROLS IN ACUTE SUPPURATIVE OTITIS MEDIA O. SALA and G. B. STEPHANI, J. franc. oto-rhino-laryng. 6:879 (Oct.) 1957.

This is primarily the results of an investigation made by the authors, on the effectiveness of the tocopherols (vitamin E) on the course of the acute suppurative processes in the middle ear. They used 30 rabbits and produced a unilateral acute purulent otitis media by instilling phenol into the middle-ear cavity. Each animal was given the same dose of the antibiotics; 15 animals received vitamin E intramuscularly every other day. The animals were killed at various times, from 3 to 15 days after the start of the experiment. Both macroscopic and microscopic evaluations and comparisons were made. It was found that where the vitamin E was administered, there was very little evidence of inflammatory changes in the mucous membranes of the middle ear. The authors believe that this is due to the influence on the permeability of the capillaries of the middle ear.

They are now treating a number of patients who have subacute otitis media, or have had either tympanoplasties or fenestrations, and they have obtained remarkable results.

PERSKY, Philadelphia.

Larynx

FURTHER EXPERIENCE WITH ANTI-MICROBIAL THERAPY OF LARYNGEAL TUBERCULOSIS. LINDEN J. WALLNER, Eye, Ear, Nose & Throat Month. 36:397 (July) 1957.

The observations represented in this article are based upon observations made since 1948 on a large number of patients with laryngeal tuberculosis. The author served as consultant in

otolaryngology of male patients in a Municipal Tuberculosis Sanitarium with 1452 beds, 60% of which were for males, and in addition at a Veterans' Administration Hospital with 372 beds for tuberculosis. The incidents of laryngeal involvement in pulmonary tuberculosis has been estimated as being from 5% to 10% in the period just before streptomycin was introduced. In a 12-month interval in 1948 and 1949 there were 63 new cases of tuberculosis of the larynx out of 1400 admissions. In a 12-month period beginning April, 1955, only 17 new cases of tuberculous laryngitis were discovered, all in new admissions to the hospital, out of a total of about 1000 admissions.

Laryngeal involvement is always secondary to pulmonary tuberculosis and must be treated as a separate entity, but in conjunction with the therapy of the patient's primary illness. The antimicrobial therapy administered for the pulmonary disease is the treatment of the laryngeal tuberculosis.

Modern management of pulmonary tuberculosis consists of general supportive measures of sanitarium care, including bed rest, proper diet, and fresh air; chemotherapy, and surgery, including pneumotherapy, phrenic section, thorocoplasty, and resection.

Antimicrobial therapy for tuberculosis includes streptomycin, sodium para-aminosalicylate, isoniazid and viomycin. Because tubercule bacilli develop resistance to the drugs under certain circumstances, at least two of the drugs should be given simultaneously. These drugs should be given without interruption throughout the entire period of treatment, and this therapy should be prolonged for many months, or even years. The regimens most commonly used today consist of isoniazid, 100 mg. t. i. d., and sodium PAS, 5 gm. t. i. d. daily, or isoniazid 100 gm. t. i. d. daily, and streptomycin, 1 gm. intramuscularly twice per week. Viomycin, because of its toxicity, is used only in those patients who become resistant to the other drugs.

Streptomycin is used instead of dihydrostreptomycin at this time because when the latter drug has toxic effects on the auditory nerve, it is apt to involve the cochlear division, whereas the toxic results of streptomycin usually involve the vestibular branch. Toxic reactions, however, are extremely rare with the present schedule of 1 gm. of streptomycin given twice weekly.

The antimicrobial therapy of tuberculous laryngitis is so effective that other measures of treatment are then necessary. Pain is completely relieved within a week or ten days of treatment, the voice is gradually restored, and the pathologic changes heal with little or no residual changes. Healing of the laryngeal lesions is not dependent on corresponding improvement of the chest disease or improvement of the patient's general condition. Postmortem examination of the larynx in patients who died of pulmonary infection confirmed the inactivity of the laryngeal disease.

The steroids are contraindicated in the treatment of laryngeal tuberculosis except for some limited value in the treatment of certain complications of tuberculosis such as meningitis or miliary disease. In six patients with laryngeal tuberculosis, the effect of cortisone and corticotropin was observed, and there was no improvement in the gross appearance of any of the lesions of the larynx after 10 to 22 days of steroid therapy. Serial biopsies revealed increased inflammatory response, lessened limitation of tubercles, and increased bacilli after treatment.

JENNES, Waterbury, Conn.

TRACHEOSTOMY. V. NEGUS, Laryngoscope 67:1098 (Nov.) 1957.

Tracheostomy means making a window in the trachea for insertion of a cannula. It is done in operations for treatment of congenital stenosis, when there is subglottic edema, for injuries with urgent dyspnea, perichondritis following injury, diphtheria, acute tracheobronchitis, poliomyelitis, growths causing obstruction, and paralysis of the larynx. Physiologic considerations are discussed. It is pointed out that humidification of the inspired air is important in a tracheostomized patient. The operation should be done at a low level, usually at the third or fourth ring. A round opening into the trachea is preferred. A particular type of cannula is used. It is described. After-care is discussed. The patient should be able to live a normal life except for the avoidance of swimming. Negus' experience has been that patients prefer this to operations designed to relieve laryngeal paralytic obstruction.

HITSCHLER, Philadelphia.

RESULTS OF SURGERY IN CANCER OF THE LARYNX. MICHEL ARSLAN, J. franç. oto-rhino-laryng. 6:861 (Oct.) 1957.

The author reviews the results of surgery of the larynx from 1936 to 1956 at the University of Padua. The various operative procedures were determined on the basis of (*a*) the topographic localization of the cancer; (*b*) the involvement of the muscular base; (*c*) the strict unilaterality of the cancer; (*d*) the presence of cervical glands with metastatic phenomena; (*e*) the general condition of the patient, and (*f*) the histopathologic characteristics of the neoplasm. The procedures are as follows:

1. Cordectomy—where the lesion is limited to a part of one cord and without any impairment in the mobility of the cords—112 cases operated on, with 109 survivals (54 over five years), 5 recurrences, and 3 deaths.

2. Lateral hemilaryngectomy—invasion of the entire length of the vocal cords or the supraglottic space but never below the level of the cords, or an involvement of the muscular planes and an interference with the mobility of the cords. Two factors are considered in the choice of the surgical technique—care in dealing with the alae of the thyroid cartilage and preserving the arytenoids. There were 73 cases, with 28 survivals (24 more than five years), 28 recurrences, and 8 deaths.

3. Frontal and frontolateral hemilaryngectomy—Cancer of the two vocal cords localized to the anterior portion, anterior commissure—38 cases with 22 survivals (12 more than five years), 17 recurrences, and 4 deaths.

4. Partial horizontal laryngectomy—The decision to substitute a conservative procedure for a total laryngectomy is so important that the indications for this operation must be established with extreme precision. The indications are all types of subglottic cancer. There were 33 cases, with 17 survivals, 14 recurrences, and 5 deaths.

6. Total laryngectomy—extension beyond the limits of its origin or the vocal cords—subglottic with invasion of the arytenoid area, superglottic with marked lateral extension, involvement of the pyriform sinus and posterior extension to involve the cricoid and arytenoids. There were 470 cases with 291 survivals, (158 more than five years), 145 recurrences, and 42 immediate deaths.

Radiotherapy was given to every case postoperatively, and where there was an extensive spread to the cervical glands preoperative radiation was also given.

PERSKY, Philadelphia.

ENDOLARYNGEAL CARCINOMA. E. H. MILES FOXEN, J. Laryng. & Otol. 71:787 (Dec.) 1957.

This article is based on a survey of 206 cases of endolaryngeal malignancies treated by surgeons and radiotherapists of Westminster Hospital during the last 23 years.

For the purpose of this study the lesions were divided into five groups: the midcord, glottic, supraglottic, subglottic, and bilateral groups. Teleradium and telecobalt were used as the treatment of choice. Surgical treatment was used only in recurrences.

Favorable results were obtained with midcord lesions, and "as a rule" they remained well for years. Of 59 patients 6 died of recurrence.

Unfavorable results were obtained in the subglottic group; only 9 out of 38 survived radiotherapy. Teleradiotherapy is the treatment of choice in mobile glottic lesions, while glottic lesions with reduction of mobility, supraglottic and bilateral lesions present difficult problems in treatment. Although laryngectomy with radical neck dissection is indicated in these cases, often this procedure is side-stepped by the policy of radiotherapy first with surgical treatment for recurrence. This policy, though attractive in its efforts to spare the larynx, is fraught with danger. The author states there should never be any hesitation in performing bilateral neck dissection and believes there is seldom any indication for laryngectomy unaccompanied by radical neck dissection.

LEJEUNE, New Orleans.

THE MECHANISM OF THE LARYNX. V. NEGUS, Laryngoscope 67:961 (Oct.) 1957.

This is a very comprehensive and well-written article. It begins with the evolution of the larynx in the lower animals in order to better explain the mechanism in man. The function of the "larynx" in certain amphibious fish is merely to keep out water from the lung. Its further development is traced through the higher animals. The various anatomical parts are described in relation to function. There are numerous illustrations.

In animals who depend upon the sense of smell for their well-being, the epiglottis is so placed that the air flow must pass over the olefactory organ. As man develops, and there is less dependence upon smell, the laryngeal structure changes; there is no longer opposition of the epiglottis and the soft palate.

The larynx also has to do with swallowing, control of the air stream, and the regulation of intrathoracic air pressure. It protects the lungs from foreign bodies and, of course, produces sound and speech. It is emphasized that this last is unimportant as compared with its functions relating to respiration and deglutition.

HITSCHLER, Philadelphia.

Nose

THE MAXILLOFACIAL TRIAD. IRVING B. GOLDMAN, Eye, Ear, Nose & Throat Month. 36:419 (July) 1957.

The term maxillofacial triad was suggested in 1951 by Goldman to designate certain characteristic deformities caused by nasal trauma in early childhood which prevented the normal development of facial features. The triad consists of the nasal deformity, a high vaulted palate, and a receding chin. Obstructive septal deviations in childhood can produce the same facial, dental, and palatal maldevelopment that follows obstructive hypertrophied adenoids. Adequate attention to nasal injuries in childhood will prevent the development of the maxillofacial triad. Traumatic nasal deformities barely noticeable or overlooked in childhood become gradually accentuated in adolescence. A harmonious facial skeletal development is paradoxically produced by the opposed but balanced action of two sets of muscles, the extrinsic facial muscles and the lingual musculature. Mouthbreathing, due to a nasal obstruction, interferes with the forward and lateral expansive lingual pressure, and the concomitant unopposed action of the facial muscles produces palatal vaulting. There follows dental distortion, malocclusion, and overbite, and microgenia or micrognathia.

Treatment is directed towards the correction of the nasal deformity by rhinoplasty and septal reconstruction, and the restoration of normal chin contour and projection by the use of cartilage or bone implants. The palatal distortion may be corrected by an orthodontist if not seen too late. Goldman refers to his technique for correction of caudal displacements of the septum with or without concomitant disturbance of the nasal framework, which is effective in both children and adults.

JENNES, Waterbury, Conn.

RHINOLOGY IN CHILDREN: RÉSUMÉ AND COMMENTS ON THE LITERATURE FOR 1956. D. E. S. WISHART, J. B. WHALEY, and W. B. WALLACE, Laryngoscope 67:833 (Sept.) 1957.

The question of the value of chemoprophylaxis for upper respiratory disease and its possible effect in the reduction of the number of tonsillectomies and adenoidectomies necessary is discussed. The question arises, too, as to whether by reducing the number of infections in the young child, one is not merely postponing these infections to a later date because of the lack of immunity which would have been acquired had the illnesses occurred.

There are many questions still unanswered concerning the APC virus infections. Characteristically, there is less conjunctivitis, pharyngeal inflammation, and cervical adenitis. A vaccine for the prevention of upper respiratory infections may be available in the not too distant future.

The tonsillectomy-poliomyelitis relationship question is still unsettled, the studies of smaller numbers of cases indicating a relationship, and the studies of larger numbers indicating none.

Radiation of the nasopharynx is effective in restoring hearing in many cases after adenoidectomy has failed.

Tyzine has been shown to be a central nervous system depressant, especially in infants under one year.

Choanal atresia and aglossia are discussed as congenital anomalies.

HITSCHLER, Philadelphia.

Pharynx

EFFECT OF A NEW CHEWING TROCHE ON POST-TONSILLECTOMY MORBIDITY. CARL GRANBERRY and W. P. BEATROUS, Eye, Ear, Nose & Throat Month. 36:294 (May) 1957.

An antibiotic-analgesic chewing troche was used during convalescence after tonsillectomy. The antibiotics were neomycin and gramicidin and the analgesic used was propesin. The group

observed included 18 adults who had undergone tonsillectomy alone, and 46 other patients who had had both tonsillectomy and adenoidectomy. The authors noted subjective benefits which could be attributed to the medication. Nearly all of the 64 patients were able to return to a full diet by the third to the fifth day, instead of the usual week or 10 days. Only two patients complained of mild otalgia. There was only one case of secondary bleeding in this series. Although evaluation of this medication was difficult owing to the largely subjective nature of most complaints following tonsillectomy, the observations of the authors in this series lead them to believe that this chewing troche is of value in minimizing and shortening post-tonsillectomy morbidity.

JENNES, Waterbury, Conn.

PERITONSILLAR ABSCESS IN AN INFANT, AGED SIX WEEKS. SIDNEY S. SAMUELS, Eye, Ear, Nose & Throat Month. 36:295 (May) 1957.

Peritonsillar abscess has been generally regarded as a disease of adults rather than children or infants. The age level has been one of the criteria in the differential diagnosis between peritonsillar and retropharyngeal abscesses.

A case is presented of an infant aged 6 weeks with a peritonsillar abscess. The infant was in severe respiratory distress, with marked inspiratory stridor, circumoral cyanosis, and subrasternal and substernal retraction. The left half of the soft palate, the uvula, and the left faucial region were tense and bulging. The abscess was incised with release of over ½ oz. of thick greenish pus under pressure. There was immediate disappearance of respiratory distress, and the patient was afebrile within 36 hours.

JENNES, Waterbury, Conn.

PREVENTION OF SECONDARY HEMORRHAGE IN TONSILLECTOMY. EMORY A. RITTENHOUSE, Eye, Ear, Nose & Throat Month. 36:406 (July) 1957.

A medicated chewing gum containing the antibiotics, neomycin sulfate and gramicidin, plus a local anesthetic propesin, has been used in a group of 70 patients undergoing tonsillectomy with or without adenoidectomy. This combination offered broad-spectrum antibacterial action with a low degree of sensitization, relief of pain, and desirable exercise of the throat muscles. A similar group of 70 patients who did not receive the medicated gum was used as a control group. Only one instance of secondary bleeding developed in the treated group, whereas some hemorrhage was encountered in 20% of the untreated group. Postoperative pain was less severe in the treated group, and there was an absence of malodorous breath in this group. The tonsillar fossae of the patients receiving the drug were uniformly cleaner and free from excessive granulation tissue. No cases of hypersensitivity were noted in the series.

The rationale of the use of this medication to prevent secondary hemorrhage is based upon the observation that most cases of secondary hemorrhage occur at the time when the septic membrane is sloughing. Reduction of the amount of infection, therefore, would reduce the incidence of hemorrhagic complications. The routine use of penicillin or penicillin-triple sulfonamide mixtures in an effort to control postoperative infection has often led to the development of drug sensitization. The systemic use of these drugs does not appear to improve the healing of the wound. Neomycin and gramicidin offer the advantage of being virtually nonsensitizing and of not being used systemically.

ABSTRACTER'S COMMENT: Following the premise presented by the author that secondary infection of the operative site predisposes towards secondary hemorrhage, it would seem appropriate to utilize an oral broad-spectrum antibiotic so that the incidence of post-adenoidectomy hemorrhage may be reduced at the same time as that of posttonsillectomy hemorrhage. The medicated chewing gum described in this article may well prove to be useful addition to the armamentarium in the prevention of secondary hemorrhage following tonsillectomy. It is, however, the postadenoidectomy hemorrhage which so often is insidious and which constitutes a greater threat to security.

JENNES, Waterbury, Conn.

INSTRUMENT AND METHOD FOR REMOVING ADENOIDAL REMNANTS IN THE HEAD LOW POSITION. JAMES T. KING, Eye, Ear, Nose & Throat Month. 36:464 (Aug.) 1957.

A reverse modification of the Ronis forceps is used after removal of the main adenoidal mass to resect any remaining adenoidal tissue. Operation is performed with the Davis mouth gag technique, and the modified forceps is used under guidance with a No. 1 laryngeal mirror.

JENNES, Waterbury, Conn.

Analysis of Blood and Vascular Factors in the Prophylaxis of Tonsillo-Adenoidal Hemorrhage. James E. Coyle, Laryngoscope 37:1029 (Oct.) 1957.

The older theories of blood coagulation have been proved inadequate. There are three distinct phases in the newer theories: the activation of thromboplastin, the formation of thrombin, and the production of fibrin. It is an active process. Its dynamics are to be emphasized. However, the cause of hemorrhage is often not failure of the coagulation process, but rather abnormalities of the vascular bed, especially of the smaller vessels. Not enough is known of this factor.

The five present theories of coagulation are discussed, that of Owren's in detail.

Laboratory tests help determine the hemorrhagic tendency. These tests are enumerated and discussed, and their relative importance and value assessed. The bleeding time, the prothrombin time, and the prothrombin consumption test are the only ones required to diagnose most hemorrhagic diseases.

Recently two drugs have been discovered that improve the vascular or capillary status. They are the flavinoids and adrenochromazone. The use of these both pre- and postoperatively is highly recommended.

Hitschler, Philadelphia.

A Case of Aberrant Lingual Thyroid. J. P. de Villasante and J. J. Collado, Acta oto-rino-laring. ibero-am. 8:433, 1957.

The author reports a case of a 22-year-old girl who complained of a swelling at the base of the tongue. This was of six years duration. Occasionally there was some slight pain on swallowing. Mirror examination revealed a large swelling—about the size of an egg—on the right side of the base of the tongue. This was sessile and extended down to the epiglottis, and it did not show any connection with the anterior surface of the epiglottis. It had a rather soft consistency, resembling a cyst.

Under local anesthesia, a small section was removed for biopsy, at which time a small quantity of a yellow fluid was released. Subsequently, the entire mass was removed. This proved to be aberrant thyroid tissue.

In these cases of lingual swelling, it is important to evaluate the thyroid function by radioactive iodine. This mass may be the only thyroid tissue present; hence its removal poses the problem of a future hypothyroidism.

Persky, Philadelphia.

Cancer of the Tonsil in the Female. Ag. M. Gignous; J-P Rebattu; J. Papillon, and J-F Montbarbon, J. franç. oto-rhino-laryng. 5:681 (Dec.) 1956.

In analyzing 474 cases of cancer of the tonsils (epitheliomas and sarcomas), the authors found 35 were among females, of which 20 were epitheliomas and 15 were sarcomas.

The epitheliomas were classified as to type: ulcerative 10.5%, budding 47.3%, infiltrative 15.3%, mixed 28.4%. The locations of the lesions were as follows: (1) involving the tonsil or one of the pillars—0%, (2) tumors involving the tonsils and the pillars but without any further extension—20%. (3) tumors involving two adjacent regions, or with involvement of the glands, or those firmly fixed in the deep planes—70%; and (4) bilateral involvement, with extension to the cervical glands or markedly fixed to the deep planes—0%. The histology of the tumors showed them to be spinocellular in 10 cases, basocellular 4, undifferentiated 2, and glandular 2. In 16 of 19 cases there was a definite involvement of the glands. Of 15 patients that were followed, 7 were alive after a five-year period. The type of lesion and its location are important factors in this result. It is difficult to evaluate the effectiveness of the various forms of treatment, since the series is small. This included radium, roentgen therapy, and surgery. These modalities were used alone or in combination. However, the authors feel that roentgen therapy alone proves satisfactory, and that local surgery should often supplement the above, and that glandular excision is not an important factor for cure.

Among the sarcomas there were seven cures after five years.

Persky, Philadelphia.

Contribution to the Study of Reticulosarcoma of the Palatine Tonsil. Alvaro Giagnoni, Valsalva 33:280 (Oct.) 1957.

In perusing the literature of many publications as stated in this article, the author finds that there is still lively discussion, as shown by the numerous proposed classifications, relative to the morphology of reticulosarcoma of the palatine tonsil.

Two cases are studied in detail clinically and pathologically, and differential diagnosis is discussed so that the tumors may be readily defined.

It is likewise reported that roentgen therapy has a prompt and favorable result, with no reproduction of the tumors over a five- to six-year period.

DE LUCA, Philadelphia.

Miscellaneous

PREOPERATIVE SEDATION WITH MEPROBAMATE (MILTOWN) IN SURGERY OF EYE, EAR, NOSE AND THROAT. E. CLARENCE KERN, Eye, Ear, Nose & Throat Month. 36:408 (July) 1957.

Meprobamate has been utilized on over 300 patients undergoing office surgery of the eye, ear, nose, and throat. This drug is effective orally in about 20 to 30 minutes, and the duration of effect is about six hours. Most patients became quiet, relaxed, and cooperative, and very few required additional sedation. This appeared ideally suitable for office procedures as it was free of undesirable after-effects. The author has therefore found this drug to be a useful adjunct in the care of the tense, apprehensive, and agitated patient undergoing surgery in the office.

JENNES, Waterbury, Conn.

BRANCHIAL CLEFT CYSTS, FISTULAE AND APPENDAGES. JACK B. MILLER, Laryngoscope 67: 1123 (Nov.) 1957.

This is a very comprehensive article of 71 pages. All the available literature has been reviewed. There is a complete bibliography, making it a good reference work. Included is discussion of the controversial theories of etiology, incidence, symptomatology, diagnosis, pathology, and out treatment. Under each of these headings are the opinions of many authors. A summary of the cases operated upon at the Emanuel Hospital, Portland, Ore., is included, together with several case reports.

HITSCHLER, Philadelphia.

TREATMENT OF EMERGENCIES IN ALLERGY. MARY HEWITT LOVELESS, New York J. Med. 57:3797 (Dec. 1) 1957.

Dr. Loveless is a researcher in Allergy in the Department of Medicine, New York Hospital and Cornell University Medical College. The common emergencies are intractable asthma; severe serum sickness; acute angioneurotic edema (glottis), and allergic shock. Agents setting up reactions are infectants, injectants, and inhalants (pollens). *Serum disease* is confused sometimes with delayed allergies (incubation period), which may not be manifest for 8 to 14 days after a foreign serum, antibiotic, venom, or hormone has provoked an initial antigen-antibody reaction. In status asthmaticus, bronchioles are contracted and contain a sticky mucus, thus narrowing the tubes so that only a relatively small portion of a lung is in use for breathing, and the necessary exchange of oxygen for waste. The fundamental difficulty in asthma is impairment of the gas exchange in the alveoli and in the blood of surrounding capillaries. Oxygen exchange is the first to become abnormal, followed by carbon dioxide, especially in more advanced conditions. Emphysema is a late comer in long-standing asthma with breaking down of the alveoli partitions. . . . Cardiac asthma, so-called, is often associated with mitral stenosis, left ventricular failure from hypertension, coronary artery, or aortic valve disease. . . . There is much more to this, but from the laryngologist's standpoint angioneurotic edema affecting the larynx is the most important. Obstruction to breathing comes on suddenly with dyspnea of severe degree, cyanosis, and partial or complete loss of consciousness. . . . Such a scene calls for immediate action.

Intravascular therapy with 50 mg. of prednisolone or 100 mg. of hydrocortisone hemisuccinate in a few milligrams of diluent is mentioned and may meet the emergency, but in a precarious moment there is no substitute for letting air into the lower airways by making an opening into the trachea. In summary: One must correct hypoxemia or in advanced cases hypercapnia. Gas exchange may be accomplished by intensive aerosol with adrenergic amines. Aminophylline into rectum or a vein with intermittent pressure breathing in inspiration using air or oxygen may be tried. The failing heart will be supported by digitalis in some form. If there is bacterial infection, one will have already administered elective antibiotics. If and when the respiratory center is depressed, one should be careful with opiate or barbiturates. ACTH has a place for those who know how to use it.

When the emergency is over, it becomes the duty of the internist to look for causes, and to seek out the disturbing allergen.

ABSTRACTER'S COMMENT: This is a brilliant exposé of the entire allergic problem based on intensive research. Any one of us who has seen the distress of a dyspneic patient will recognize the precarious moment which calls for immediate action. A laryngologist (or bronchoscopist) who is called into consultation needs to know something of the past history and previous medication employed. Anesthesia is not a primary but a secondary consideration. In fact the patient may well be unconscious and therefore readily dealt with. There is great danger of paralysis of the respiratory center; therefore morphine in any form or other depressants should be avoided. Not all such patients are seen in a hospital. It may be necessary to open the trachea in a patient's bed at home, or even on the kitchen floor! Temporizing may result in a fatality.

I. W. VOORHEES, New York.

DISCUSSION ON TUBERCULOUS ADENITIS. T. J. WILMOT, Proc. Roy. Soc. Med. 50:1057 (Dec.) 1957.

This discussion was part of the proceedings of the Section of Laryngology held May 3, 1957, with the President, J. Angell James, M.D., M.R., C.P., F.R.C.S., in the chair. The speaker said that cervical adenitis is not now a common condition in Great Britain, but persists in Northern Ireland to some degree. The primary source of infection is in the tonsils, but formerly the general surgeon neglected these and busied himself with the glands only. The ENT specialist, trained as he is in all aspects of the buccal cavity, is best fitted to deal with this condition. But it is well to work also with the chest physician, as Mr. Wilmot does. During some five years, November, 1951, to July, 1956, 78 patients were investigated as to cervical adenitis. In all but two the condition was unilateral and involved the upper deep cervical, submandibular, supraclavicular, posterior triangle, submental regions, and a mixed group. As to age, young children are seemingly most frequently affected; yet some 44.8% were 15 or over, and 34.5% were 25 or older. Usually there was no fever. The "lump in the neck" may have been quite recent, or may have existed for many months. In only 5.1% did active pulmonary tuberculosis coexist. It is best to admit the patient for general physical work-up, including, of course, x-ray of the chest, and tuberculin sensitivity. Chemotherapy is begun and continued whether or not surgery is undertaken. This continues for not less than three months. Tubercle bacilli were not always found at the site or in the specimen removed. Some 39 out of 51 were positive for the organism, however. Cultures were difficult to grow.

Once the diagnosis is set, it becomes a matter of judgment whether to do an A. and T. and wait to do gland resection, or to clean up a "soft gland" by partial removal and curettage, then do the intraoral operation. The teeth and gums will, of course, receive adequate attention. Isoniazid is introduced at once and continued as above mentioned—5 mg. per kilogram, with PAS in doses of one cachet (1.5 gm.) for every 50 mg. tablet of isoniazid. In very young children the syrup form is used instead of tablets, and the PAS is omitted. In cold abscess with skin involvement, as much of the skin is removed as is judged to be unhealthy. Sharp dissection plus suction is the rule. All wound cavities are irrigated with PAS solution before suture. No secondary infection has been observed. Children return to school within two or three weeks after surgery. Complications are limited to nerve injuries (the spinal accessory or some branch of the facial), but these seem not to be permanent. Keloid occurred in two patients, but was well controlled by radiation.

ABSTRACTER'S COMMENT: The question of anesthesia is not mentioned by the author. One might well hesitate about giving gases. Pentothal sodium would seem in order, since it often works wondrously well in head and neck operations with a minimum of dangers. Years ago I had a few excellent results with ultraviolet rays (using the Hanovia water-cooled apparatus). The cervical glands were reduced in size, but surgery was still in order. We did not have chemotherapy then. One seldom used the word "cured." *Relieved* is always safer, because no man can guarantee the future. . . . I have seen no recent article in the American literature in re tuberculous glands in the neck. Is the condition still observed now and then in the larger clinics?

I. W. VOORHEES, New York.

THE MIDDLE LOBE SYNDROME. NILS G. RICHTNÉR. Acta oto-laryng. 47:527 (June) 1957.

The author reports 20 cases from the Central Dispensary in Stockholm. These represent pronounced atelectasis of a portion of the middle lobe. The diagnostic distribution of these cases was as follows: Five were certain tuberculosis. Eight had nonspecific changes that did not regress. Three nonregressing cases led to operation. All three showed chronic nonspecific changes possibly caused by a calcified foreign body. In five cases the changes regressed in a relatively short time. In two this followed almost immediately after bronchoscopy in conjunction with aspiration of secretion. In two additional cases the atelectasis in the middle lobe was probably caused by a foreign body.

LEWY, Chicago.

ECTOPIC LINGUAL THYROID. V. BOTNER, J. franç. oto-rhino-laryng. 6:905 (Oct.) 1957.

The author made a critical review of the problem of the ectopic lingual thyroid. He stresses the importance of a careful evaluation of the function of both this tissue and the normal thyroid by radioactive iodine. This is important so that the proper method of treatment can be decided upon and instituted without the danger of incurring a postoperative myxedema.

Three cases are presented—one in which the entire aberrant gland was removed from the base of the tongue and an abdominal implant of the thyroid tissue was made. Functional tests by means of isotope diagnosis showed that the graft was fully controlled three years later. The other two cases had a partial removal of the aberrant tissue and received conservative treatment. None of these cases showed any postoperative evidence of hypofunction of the thyroid.

PERSKY, Philadelphia.

THE ACTION OF PILOCARPINE UPON THE ELIMINATION OF IODINE FROM SALIVARY GLANDS UNDER NORMAL CONDITIONS AND FOLLOWING SECTION OF THE CHORDA TYMPANI. G. MOTTA and A. PROFAZIO, Oto-rino-laring. ital. 25:236, 1957.

The material in this work is a further elaboration of a previously published article. In that instance it was stated that in patients who were subjected to radical mastoid surgery in one ear for chronic mastoiditis, resulting in section of the chorda tympani, the submaxillary gland on the surgically treated side had a diminution in the quantity of secretion as compared with the other side.

In this study 10 patients who had radical operations in one ear were used to determine the amount of iodine which was secreted through the saliva of the two submaxillary glands after the intravenous administration of a 2% solution of sodium iodide. To establish the quantity of iodine which was present in the saliva a colorimetric method was used. It was observed that the concentration of iodine is higher in the saliva secreted by the gland on the side in which the chorda tympani had been sectioned. This was a definite finding in 7 of the 10 cases, and in the other 3 it was inconclusive.

Following the administration of 25 mg. of pilocarpine there was a strong diminution of the concentration of iodine in the salivary secretion of both submaxillary glands. However, the amount of iodine secreted percentagewise in each of the two glands was not constant in these cases, so definite conclusions could not be made.

DE LUCA, Philadelphia.

Correction

In an article entitled "Acoustic Neurilemoma," by Dr. Kenneth Cambon and Dr. Frederick R. Guilford in the March issue (p. 303), the last sentence of the paragraph beginning *(c) Audiometric and Caloric Findings* should read: "Ireland (*Ann. Otol. Rhin. & Laryn.* 58: 716, 1949) reported four cases with normal caloric responses, and Kristensen (Copenhagen) states that 10% of the cases have a normal caloric response."

Books

BOOK REVIEWS

Ear, Nose and Throat Dysfunctions Due to Deficiencies and Imbalances. By Sam E. Roberts, M.D. Price, $8.50. Pp. 324, with 58 illustrations. (Simultaneous publication: Blackwell Scientific Publications, Ltd., 24-25 Broad St., Oxford, England; Ryerson Press, 299 Queen St., W. Toronto, 2B) Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1957.

This provocative monograph is unique, refreshing, and informative. The author has selected for discussion a wide range of diseases, dysfunctions, and syndromes of the ear, nose, and throat, including migraine, histaminic cephalgia, Ménière's disease, perceptive deafness, Hilger's syndrome, allergy, and paranasal sinus dysfunction. In each of these he presents strong evidence that the principal causes are deficiencies and imbalances due to nutritional, electrolytic, hormonal, acid-base, and insulin-sugar abnormalities.

Extensive clinical observations related to biochemistry and therapeutic nutrition are presented in support of the author's concepts of cellular physiology and cellular dysfunction. Complete chapters are devoted to specific minerals, antimetabolites, gonadal substances, and insulin-sugar imbalance. Numerous case reports are included in the discussion of each clinical entity to emphasize the value of this new therapeutic approach.

The final chapter on "Basic Therapy" reviews the present knowledge concerning adequate nutrition and then proceeds to identify systematically those substances which are of practical therapeutic value from a nutritional viewpoint, in each instance, giving the action, dosage, and mode of administration. While there will be disagreement with many of the author's theories and conclusions, nevertheless every otolaryngologist will find this monograph to be stimulating and valuable because of the bold and original approach toward the solution of the numerous problems in the neglected field of nutritional therapy.

Handbook of Noise Control. Edited by Cyril M. Harris (46 contributors). Price, $16.50. Pp. 1042, with 808 illustrations. McGraw Hill Book Company, Inc., 330 W. 42nd St., New York 36, 1957.

This book is probably the most comprehensive and authoritative book on the problem of noise and its control in the literature. There are 46 of the most outstanding experts in the field of noise control contributing to this very large volume. Only a small section is of interest and sufficiently intelligible to the otologist. This deals with the medical aspects of industrial noise and the varying effects of noise on speech, hearing, and behavior. The major portion of the book is engineering in character and highly technical. For those persons whose principal specialty deals with noise and its hazards, this book is a must as a reference.

Fortschritte der Kiefer- und Gesichts-Chirurgie: Ein Jahrbuch. Volume 3. Edited by Prof. Dr. Karl Schuchardt, Director of the Clinic and Policlinic for Dental, Oral, and Maxillary Diseases at the Hamburg and Northwest German Maxillary Clinic. Price, $22.85. Pp. 359, with 391 illustrations. Georg Thieme Verlag, Herdweg 63 (14a), Stuttgart N: American agent—Grune & Stratton, Inc., 381 4th Ave., New York 16, 1957.

This year book is a compilation of some 50 papers that were presented at the six-day session of the German society of Maxillo-Facial Surgery held in Hamburg, July 26-28, 1956.

While most of the papers deal with malignant tumors of the maxillofacial region, others are concerned with pathology, diagnosis, and therapy. There are papers related to pathophysiology, surgery, particularly maxillary and plastic surgery, radiology, dermatology, and the treatment of associated diseases of the eyes, ears, nose, and throat.

The text is amplified by numerous excellent illustrations which clarify both the pathology and the operative procedures. Furthermore, each article has a summary in three languages—by each presentation.

This book should be of extreme interest to all dentists, maxillofacial surgeons, and German, English, and Spanish. The last chapter contains the discussions that were occasioned otolaryngologists.

Directory of Otolaryngological Societies *

FOREIGN AND INTERNATIONAL

Canadian Otolaryngological Society
(Société Canadienne d'Otolaryngologie)

President: Dr. Robert T. Hayes, 42 Cobourg St., St. John, N. B.
Secretary: Dr. Donald M. MacRae, 34 Spring Garden Rd., Halifax, N. S.

Venezuela Otorhinolaryngology Society

President: Dr. Alfredo Celis Pérez.
Secretary: Dr. Jesús Miralles.

International Association of Allergology

President: Dr. Samuel M. Feinberg, 303 E. Chicago Ave., Chicago 11.
Secretary-General: Dr. José Quintero Fossas, Paseo 313, Vedado, Havana, Cuba.
Meeting: Third International Congress of Allergology.
Place: Paris. Time: Oct. 19-26, 1958.

International Bronchoesophagological Society

President: Dr. Jo Ono, Tokyo.
Secretary: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40.
Meeting: Seventh International Congress of Bronchoesophagology.
Place: Kyoto, Japan. Time: Sept. 12-14, 1958.

International College of Surgeons, Section of Ophthalmology and Otolaryngology

President: Dr. E. G. Gill, 711 S. Jefferson St., Roanoke, Va.
Secretary-Treasurer: Dr. Louis Savitt, 3403 W. Lawrence Ave., Chicago 25.

International Congress of Audiology

General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Netherlands.
Place: Leyden, Netherlands.

International Course in Paedo-Audiology

General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Netherlands.
Place: Groningen, Netherlands.

Pan-American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

President: Dr. José Gros, Havana, Cuba.
Secretary: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40.
Meeting: Sixth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology.
Place: Rio de Janeiro, Brazil. Time: Aug. 10-16, 1958.
President of Congress: Prof. R. David de Sanson.
Secretary of Congress: Dr. Walter Benevides, Caixa Postal 2838, Rio de Janeiro.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Alden Miller, 500 S. Lucas Ave., Los Angeles.
Secretary: Dr. Hugh A. Kuhn, 112 Rimbach St., Hammond, Ind.

American Academy of Ophthalmology and Otolaryngology

President: Dr. LeRoy A. Schall, 243 Charles St., Boston.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.
Annual Meeting: Palmer House, Chicago, Oct. 12-17, 1958.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

American Board of Otolaryngology

President: Dr. Gordon D. Hoople, 1100 E. Genesee St., Syracuse 10, N. Y.
Secretary-Treasurer: Dr. Dean M. Lierle, University Hospitals, Iowa City.

American Broncho-Esophagological Association

President: Dr. Walter Hoover, 605 Commonwealth Building, Boston.
Secretary: Dr. F. Johnson Putney, 1719 Rittenhouse Sq., Philadelphia 3.
Place: The Homestead, Hot Springs, Va. Time: March, 1959.

American Laryngological Association

President: Dr. Harry P. Schenk, 326 S. 19th St., Philadelphia 3.
Secretary: Dr. James H. Maxwell, University Hospital, Ann Arbor, Mich.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Lawrence R. Boies, University Hospital, Minneapolis 14.
Secretary: Dr. C. Stewart Nash, 700 Medical Arts Bldg., Rochester 7, N. Y.
Place: The Homestead, Hot Springs, Va. Time: March, 1959.

SECTIONS:

Eastern.—Chairman: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40.
Southern.—Chairman: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis, Tenn.
Middle.—Chairman: Dr. Francis L. Lederer, 860 N. Lake Shore Drive, Chicago.
Western.—Chairman: Dr. Ben. R. Dysart, 960 E. Green St., Pasadena 1, Calif.

American Rhinologic Society

President: Dr. Russell I. Williams, 408 Hynds Bldg., Cheyenne, Wyo.
Secretary: Dr. Robert M. Hansen, 1735 N. Wheeler Ave., Portland, Ore.
Annual Clinical Session: Illinois Masonic Hospital, Chicago, October, 1958.
Annual Meeting: Chicago, October, 1958.

American Otological Society, Inc.

President: Dr. Dean M. Lierle, State University of Iowa, Iowa City.
Secretary: Dr. Lawrence R. Boies, University Hospitals, Minneapolis 14.
Place: The Homestead, Hot Springs, Va. Time: 1959.

American Otorhinologic Society for Plastic Surgery, Inc.

President: Dr. Armand L. Caron, 36 Pleasant St., Worcester, Mass.
Secretary: Dr. Louis Joel Feit, 66 Park Ave., New York 16.

American Society of Facial Plastic Surgery

President: Dr. Trent W. Smith, 327 E. State St., Columbus 15, Ohio.
Secretary: Dr. Samuel M. Bloom, 123 E. 83rd St., New York 28.
Meeting: July 23, 1958, place to be announced.

American Society of Ophthalmologic and Otolaryngologic Allergy

President: Dr. Joseph W. Hampsey, Grant Building, Pittsburgh 19.
Secretary-Treasurer: Dr. Daniel S. DeStio, 121 S. Highland Ave., Pittsburgh 6.
Place: Palmer House, Chicago. Time: Oct. 16-17, 1958.

Otosclerosis Study Group

President: Dr. Joseph A. Sullivan, 174 St. George St., Toronto 5, Canada.
Secretary-Treasurer: Dr. Arthur L. Juers, 611 Brown Building, Louisville.

Society of Military Otolaryngologists

President: Capt. William C. Livingood, U. S. N. (MC).
Secretary-Treasurer: Lt. Col. Stanley H. Bear, USAF(MC), 3810th USAF Hospital, Maxwell AFB, Alabama.

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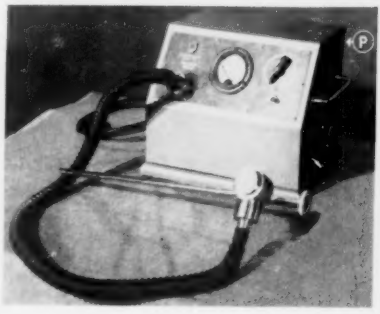

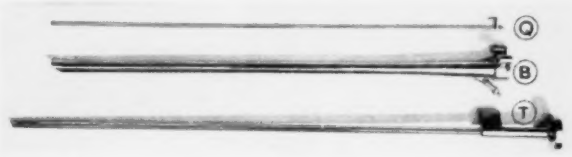

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References:

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Fourestier, M., Gladu, A., and Vulmiere, J.: LA PRESSE MEDICALE, 60:1292, (Oct.) 1952.

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———JOUR. BIOLOG. PHOTOG. ASSOC., 24:45, (May) 1956.

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